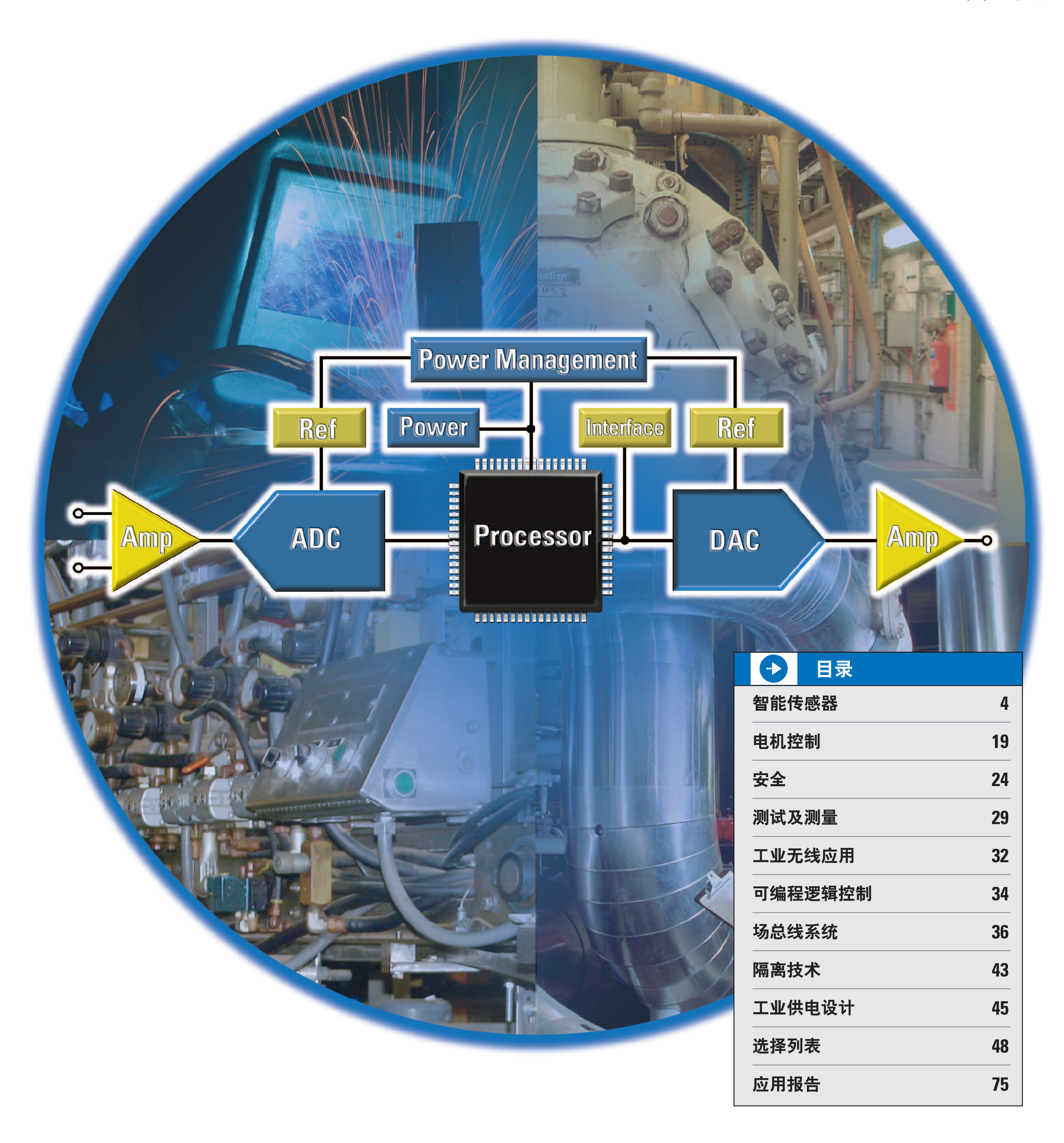
Texas Instruments

Technology for Innovators™

# 工业解决方案指南

放大器、数据转换器、数字信号处理器、数字温度传感器、
接口、微控制器、电源控制器、电源管理

2006 年第一季度




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# 目录

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## 马达控制



## 安全



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## 可编程逻辑控制



## 场总线系统



## 隔离设施



## 工业供电设计



## 选择表

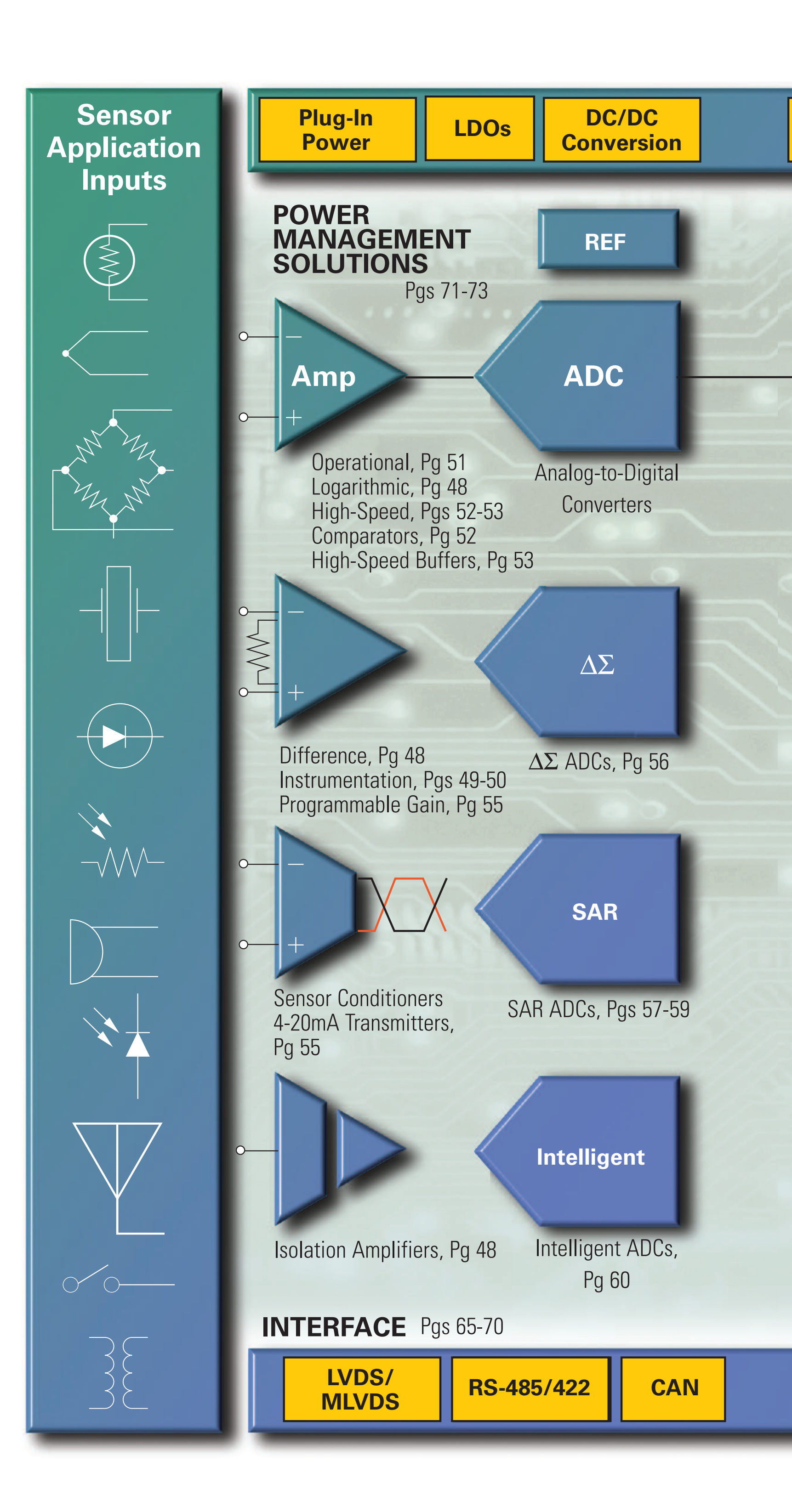


## 应用报告

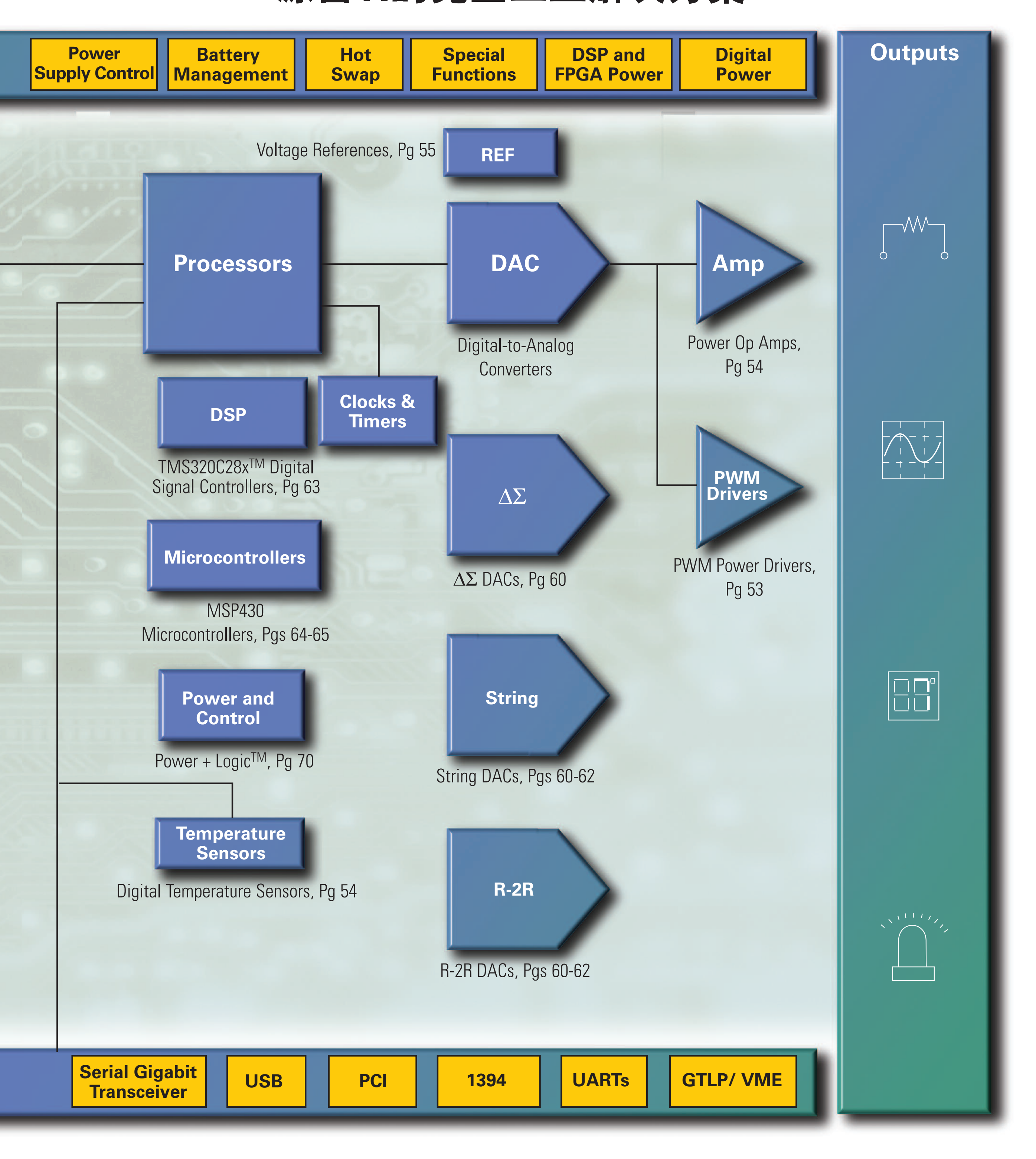


## 全球技术支持





# 源自TI的完全工业解决方案



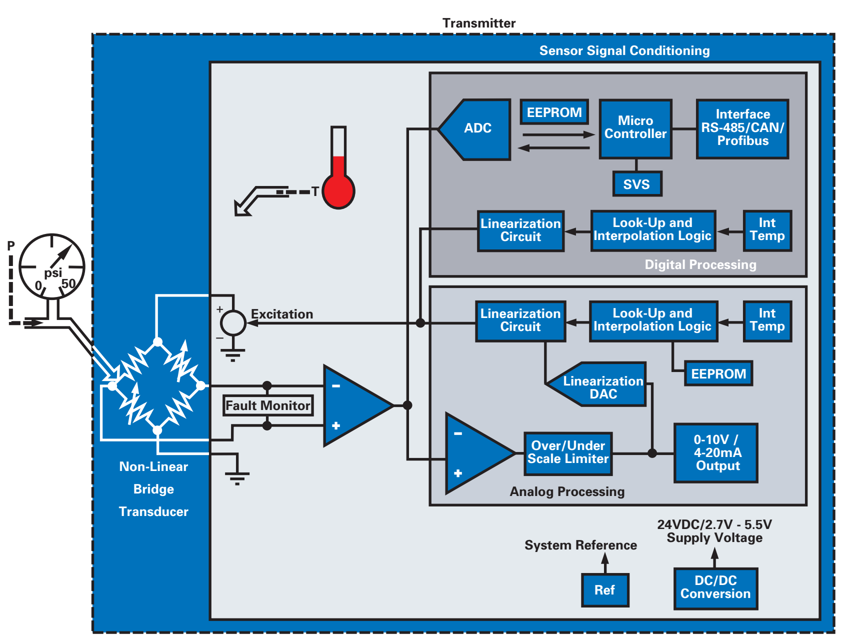
## 压力

压力传感器将某个物理量—如重量、轮胎压力、电平、力及流量转换为mV/V范围内的不同电压差分信号，并涉及金属厚膜、陶瓷或压阻。其主要的设计采用了经济高效的压电传感器(25mbar–25bar)。可是，这些器件具有很强的非线性、温度依赖性、大失调及失调漂移。另外，这些器件还需要特别注意电子校准及补偿。

右图就为我们展示了一个压力信号调节系统的原理框图。

**传感器信号调节**—展示了全部所需的性能，用于校准、温度变化的补偿、测量、以及传感器信号的线性化。

**模拟/数字化处理**—传感器信号的转换和线性化处理方法有两种。模拟技术引入了全模拟的解决方案，并提供全模拟的输出。此类技术便宜、高速，但受限于最大11-16位的精度。数字式则更加精确，最高可达24位精度，并提供均衡速度的数字输出。




压力系统原理框图

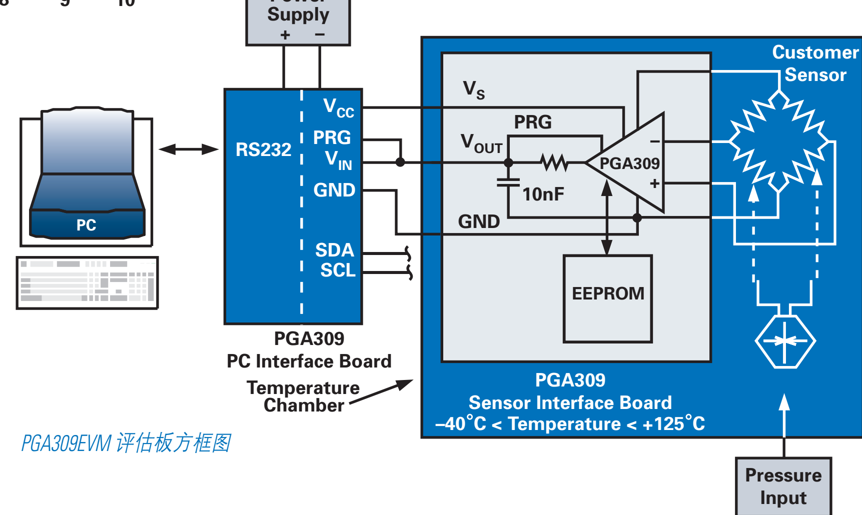
2.7
2.4
2.1
1.8
1.5
1.2
0.9
0.6
0.3
0
–0.3
Nonlinaerity (%FSR)
Uncorrected Bridge Output
Corrected Bridge Output
0 1 2 3 4 5 6 7 8 9 10
Bridge Output (mV)

PGA309桥接压力非线性修正

校准参数存储于外置的非易失性存储器中，无须手动微调并实现长期的稳定性。其评估板，PGA309EVM（参见下图）包括了软件及标度表，可用于对用户传感器+PGA309组合的简单评估。

高度集成的CMOS PGA309采用了TSSOP-16封装，是TI为电桥压力传感器量身定做，高度灵活的、低噪音放大器以及仪表放大器解决方案套件，解决方案还包括了包括了OPAx227、OPAx132、OPA335、OPA735、INA326、INA327、INA118及INA122。

桥接激励线性化回路采用抛物线波形（参见上图）为桥接压力的非线性度做了优化。线性化回路是可数字化编程的，但纯模拟信号调节端则是通过与TI知名的4-20mA发射机（如XTR105、XTR106或XTR108）相同的处理流程实现。PGA309的核心是一个采用了自动归零(auto-zero)技术的，精确的、低漂移的可编程增益仪表放大器，并包含了一个可编程错误监视器及过标度/低标度限流器。同时还包括了数字温度补偿回路。校准可通过单线的数字串行接口或通过双线工业标准连接实现。




PGA309EVM评估板方框图



## 全电压输出、可编程桥接传感器信号调节器 PGA309

敬请访问**www.ti.com/sc/device/PGA309**，以获取样片、数据表、评估板及相关应用报告。

实际应用中的传感器具有量程及偏移量误差，且随温度而变。此外，许多桥接压力传感器在外加压力时会产生非线性的输出。而PGA309传感器调节器，可以说是低成本压阻或陶瓷薄膜压力传感器的理想搭档。

### 主要特点

- 比率化或绝对化电压输出
- 通过单线或双线接口实现数字校准
- 无须电位计及微调
- 低且不随时间推移发生波动的总调节误差
- +2.7V至+5.5V工作电压
- 封装模式：小外形TSSOP-16封装

### 应用

- 桥接传感器
- 4-20mA远程发射机
- 应变、负载、衡器
- 车载传感器

*PGA309 原理框图*

## 零漂移、低失调、单电源运算放大器 OPA334、OPA335

敬请访问**www.ti.com/sc/device/OPA334**或**www.ti.com/sc/device/OPA335**，以获取样片、数据表、评估板及相关应用报告。

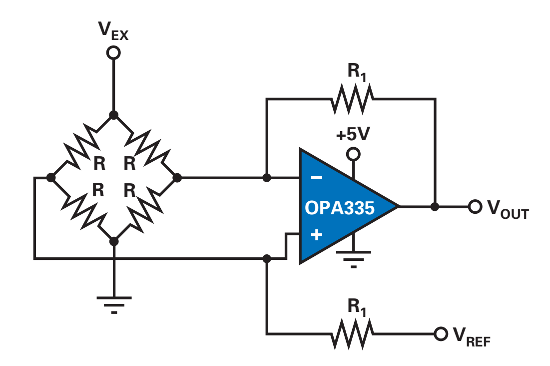
OPA334及OPA335 CMOS运算放大器使用了自动归零技术，从而同时实现了不随时间及温度变化的超低偏置电压及近乎为零的漂移。此高精确度的放大器还提供高输出阻抗及轨至轨输出摆幅。新型的OPA333将于2006年第一季度上市。

### 主要特点

- 低失调电压：5μV（最大值）
- 零点漂移：0.05μV/℃（最大值）
- 静态电流：285μA
- 封装模式：SOT23-5、SOT23-6、SO-8、MSOP-10（双通道）

### 应用

- 转换器应用
- 电子测量
- 温度测量




*OPA335 –5V单电源桥放大器*



## 压力

### 拥有优异的交流及直流性能的 24 位 ΔΣ 模数转换器 ADS1271

敬请访问**www.ti.com/ads1271**，以获取样片、数据表、评估板及相关应用报告。

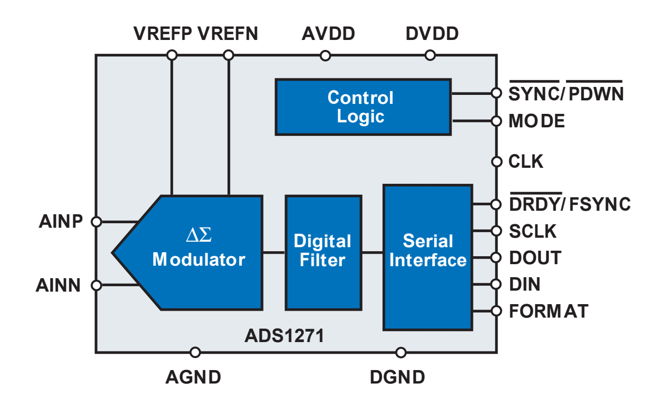
ADS1271是24位 ΔΣ 模数转换器，最高数据率可达105kSPS。其独特的整合了优异的直流精确度及出色的交流性能。高阶限幅自稳调制器实现了超低的漂移及低通带噪声。其片上的线性相位抽取滤波器抑制了调制器及信号带外噪声。ADS1271还实现了90%尼奎斯特速率的信号带宽，且仅 0.005dB 的纹波。

**主要特点**

- 交流性能：
  - 信噪比：109dB
  - 带宽：50kHz
  - 总谐波失真(THD): –105dB
- 直流性能：
  - 偏置点漂移：1.8 μV/℃
  - 增益漂移：2ppm/℃
- 低功耗模式仅有35mW功率消耗

**应用**

- 振动/模式分析、声学、动力学应变计量及压力传感器的理想应用。




*ADS1271方框图*

### 最快周期率/最低等待时间的24位ADC ADS1258

敬请访问**www.ti.com/sc/device/ADS1258**，以获取样片、数据表、评估板及相关应用报告。

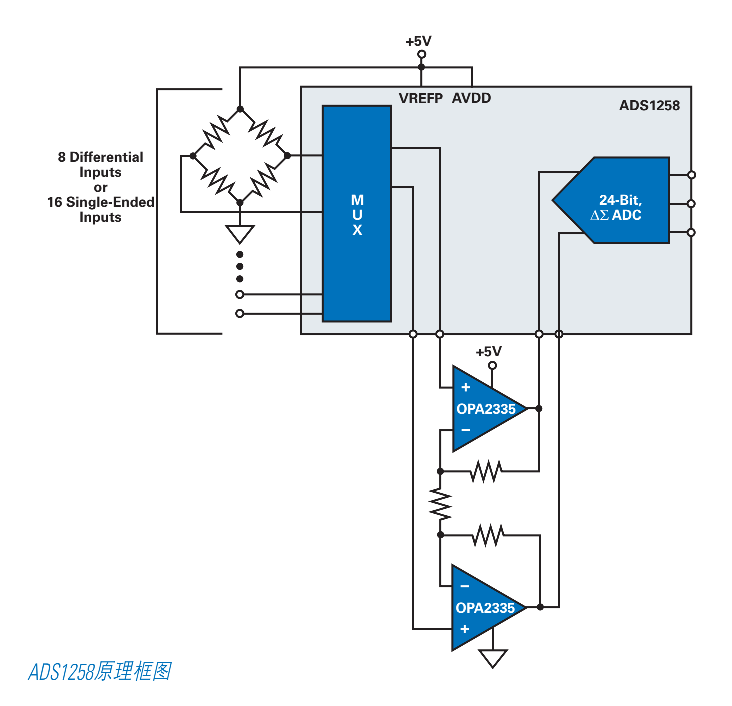
ADS1258是16通道、24位delta-sigma模数转换器。其外置接入、灵活的多路复用使得可在 ADC 输入前端加一个通用增益级 (gain stage)。片上的温度、电源及参考监视器实现了系统超低的42 μs转换时延，并提供了23.7kSPS的通道周期率。

**主要特点**

- 数据率：125kSPS
- 仅42 μs的转换时延：
  - 通道周期率可达23.7kSPS
  - 测定所有 16 个引脚的输入时间小于 672 μs
- 性能：
  - 23.7kSPS通路速率时噪声为12 μV（RMS：均方有效值）
  - 偏置点漂移：0.02 μV/℃
  - 增益漂移：0.04ppm/℃
- 灵活的多路复用架构：
  - 16路单端输入或8路差分输入
  - 外置接入以应用通用增益级
  - 自动扫描以降低软件开销
- 单或双电源运转：
  - 模拟：单5V电源或±2.5V双极性电源
  - 数字：2.7V至5V

**应用**

- 高速、多路传感器数据采集
- 高速扫描压力、应变计量、温度、电流/电压输入




*ADS1258原理框图*




## 器件推荐

| Device | Description | Key Features | Benefits | Other TI Solutions |
|---|---|---|---|---|
| **Power Management Products** | | | | |
| DCP12405 | 1W/5V DC/DC Converter | Miniature 24V DC/DC Converter with 1500V Galvanic Isolation, Integrated 5V LDO | Fully Integrated DC/DC Converter in a Miniature Package, High Isolation and Regulated Output, Smallest Height in the Industry | TPS54xx SWIFT™ Family, Highest Efficiency DC/DC Converter w/Integrated FET |
| TPS71501 | LDO: 24V/1.2V to 15V | Adjustable LDO, Ultra-Low Quiescent Current 3.5μA to 50mA | Excellent for Low-Power Applications up to 1.2V | LM317, Lowest Cost LDO with 37V Input |
| **Data Converters** | | | | |
| ADS1256 | 24-Bit ADC | 24-Bit ADC, Input Buffer, PGA, Digital I/O | Highest Resolution (23 Bits Noise-Free) and Lowest Input Noise—Up to 30kSPS | ADS1218, Core of MSC121x Family with Additional Flash |
| ADS1258 | 24-Bit, 16-Channel ADC | 24-Bit ADC, 125kSPS Data Rate | Flexible Multiplexer Structure, On-Chip Temperature | |
| MSC121x | 8051-Based MCU with ADS1218 ΔΣ Converter Including Flash Memory | 24-Bit ADC, Filters, PGA, Digital I/O, Sensor Excitation, Burn-Out Current Sources, Offset DACs, Four 16-Bit DACs, Temperature Sensor | Lowest Noise and Highest Integration in the Market, Includes All Necessary External Circuitry — All-in-One Solution | MSC1200, Low-Cost Version without DACs |
| ADS1271 | 24-Bit, 105kSPS ADC | Low Offset Drift: <1.8μV/°C, Passband Ripple <±0.005dB, THD <–105dB | 24-Bit ADC with DC Accuracy Plus AC Performance at Highest Speed up to 105kSPS | PCM4202, PCM4204 |
| **References** | | | | |
| REF3125/30/33/40 | References | Small Package, High Initial Accuracy, Low Drift | 15ppm/°C Stable Reference for Precise Data Conversion | REF30xx with Max 50ppm/°C Drift |
| REF3212/20/25 30/33/40 | References | Small Package, Excellent Low Drift Performance | 4ppm/°C, 100μA, 4-Wire Connection, Portable Applications | REF31xx |
| **Amplifiers** | | | | |
| OPA335 | Zero-Drift Op Amp | CMOS 0.05μV/°C Drift, 5μV Offset, RRIO at 3.3VDC, Single Supply | Best Long-Term Stability for Industrial Use, Single Supply, Best in Class, Automotive Temp Range | OPA735, 12V Version with Improved Noise and Drift |
| INA326 | High-Precision Instrumentation Amp | Single Supply 30nV/√Hz Noise, RRIO, CMOS | Low Noise, Excellent Long-Term Stability, Dual Supply Not Required | INA337, Automotive Temp Range, –40°C to +125°C |
| XTR115 | 4-20mA Transmitter Including Sensor Excitation | Includes All Functions to Generate 4-20mA Output Signal and Bridge Excitation | Lowest Cost All-in-One Solution (<$1) Up to 36V Supply Voltage, no Need for DC/DC Converter | XTR110 is Intended for 3-Wire Output |
| PGA309 | Programmable Pressure Sensor Conditioner | Includes Sensor Excitation, Linearization and Temperature-Compensated Conditioning, ADC, DAC, Temp Sensor | Fully Integrated Sensor Conditioning System On a Chip (SOC), Small Package, Only 16-Bit ASSP on the Market | XTR108, Similar but is Targeted for PT100, Temp Sensors Included, 4-20mA Transceiver |
| TMP121 | Digital Temp Sensor | Integrated Temp Sensor, ΔΣ ADC and SPI Interface to Convert Valve Temp into Digital Code | High Resolution and Accuracy, Extended Industrial Temperature Range, SOT-23 package | TMP175 (SMB-Bus Interface) |
| **Interface** | | | | |
| SN65HVD1176 | PROFIBUS Transceiver | Interfaces PROFIBUS Fieldbus to System Controller | Optimized for PROFIBUS, Up to 160 Users per Bus, Up to 40Mbps | SN65HVD485E, Low-Cost Version |
| SN65HVD251 | CAN-Bus Transceiver | Interfaces CAN-Fieldbus to System Controller | Improved Drop-In Replacement for PCA82C251, Tolerates ±200V Transients | SNHVD233 (3.3V Version) |
| **Processor** | | | | |
| MSP430F1121 | 16-Bit MCU with Flash | Lowest Power MCU in the Industry, 6μs Wake-Up | Reduces Heat in Sensor System, Reduces Cost of Power Source and Increases Lifetime | MSP430Cxx without Flash , Even Lower Power |



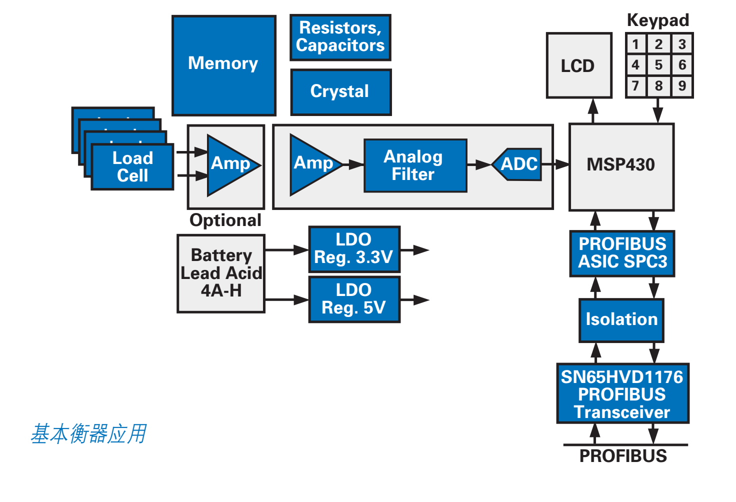
## 衡器

电子衡器以一定的外形或构造出现在许多工业应用中，特别是普遍存在于当今的食品工业中。电子衡器设备厂商一般会选用所拥有的特定用途集成电路(ASIC)来裁定其模拟前端所需的性能，同时实现高精度及稳定性。下面的框图就展示了了一个使用标准器件并提供高达23位无噪声精度的方法。

对于设计衡器来说，所面临的最大难题在于对多个负载单元采样的同时，还须维持极低的输入参考噪声 (RTI) 。ADS1256 及 ADS1232 所给出的输入参考噪声分别为 30nV 及 17nV。另一个重要的因素就是模拟回路中关于偏置点漂移和增益的长期稳定性。此处的放大输入信号的精确度，不管是单端或是差分输入，都必须保证长达数年的长期运转稳定性。自动归零放大器，如 OPA335 以及仪表放大器 INA326 都可以满足这些苛刻的要求，其可达到的偏置点漂移分别为0.05 µV/℃ (OPA335) 及0.4 µV/℃ (INA326) 。

对于易用型的解决方案来说，MSC1210系列实现一个完全的数据采集系统级芯片，其组成如下：

- 一个优化的 8051 内核(同等功耗条件下可达比标准版本快3倍的速度)
- 一个24位、ΔΣ ADC，有效字节数(ENOBs)为22，输入参考噪声为 75nV
- 一个可编程增益放大器(PGA)，增益级从0至128可调
- 2kB引导ROM以及高达32kB的闪存




*基本衡器应用*

## 完全、高精度衡器解决方案
## ADS1232, ADS1234

敬请访问**www.ti.com/sc/device/ADS1232** 及**www.ti.com/sc/device/ADS1234**，以获取样片、数据表及相关应用报告。

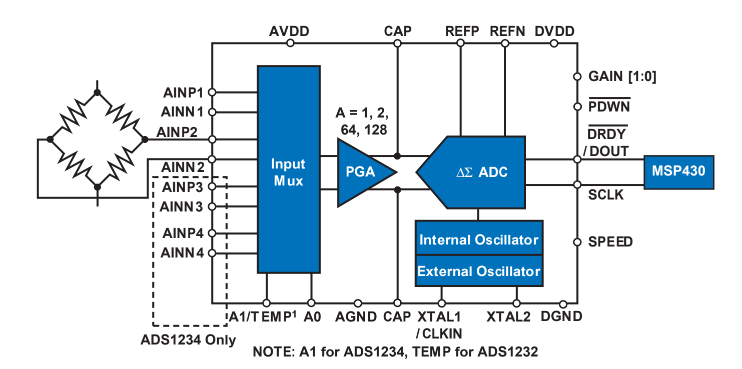
ADS1232及ADS1234设计作为高度集成的ΔΣ模数转换器，并用于低电平、高精度测量，特别是用于衡器应用。此器件由一个低漂移、低噪声的仪表放大器和一个连接在单片集成数字滤波器上的高阶限幅自稳调制器组成。可选择性增益可设置为 1、2、64、128，+5V 参考电压时，允许满刻度差动输入范围从 ±2.5V 到 ±19.5mV 。 此方案同时还包括了一个低漂移片上振荡器以及外置晶振，以实现精确的输出数据率，从而同时抑制50Hz及60Hz的频率。ADS1232 及 ADS1234 输出数据率可为 105SPS 或 80SPS，是衡器以及桥接传感器应用的理想选择。

### 主要特点

- 用于衡器的完全前端解决方案
- 超低噪音可编程增益放大器：
  - 增益倍数为128时，输入参考噪音仅为17NV
- 高性能 ΔΣ ADC：
  - 增益为1时，有效位数为23.5
- 片上低漂移振荡器及可选的外置时钟
- 优异的 50Hz 及 60Hz 抑制性能：100dB （最小值）
- 封装模式
  - ADS1232：24引脚 TSSOP封装
  - ADS1234：28引脚 TSSOP封装

### 应用

- 衡器
- 桥接传感器
- 应变测量
- 压力传感器




*ADS1232衡器应用*

衡器 

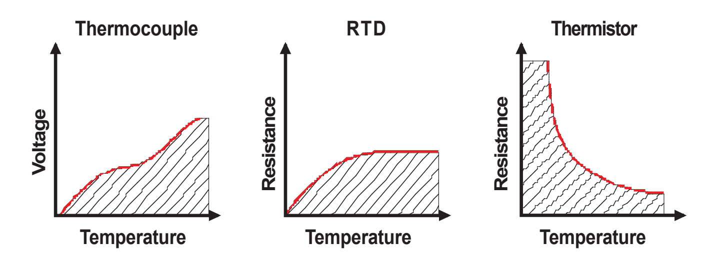
## 器件推荐

| Device | Description | Key Features | Benefits | Other TI Solutions |
|---|---|---|---|---|
| **Power Management Products** | | | | |
| TPS76301 | Low-Power 150mA, Low-Dropout (LDO) Linear Regulator | Regulates 6V to 3.3V and 5V | Small Package | TPS76333 |
| **Amplifiers** | | | | |
| OPA335 | Zero-Drift Op Amp | 0.05µV/°C Drift, 5µV Offset, RRIO at 3.3VDC Single Supply | Best Long-Term Stability for Industrial Use, No Need for Dual Supply, Best in Class, Automotive Temp Range | OPA735, 12V Version of OPA335 |
| INA326 | High-Precision Instrumentation Amp | 30nV/$\sqrt{Hz}$ Noise, RRIO, Single Supply | Lowest Noise in Industry and Best Long-Term Stability, No Need for Dual Supply | INA337, Automotive Temp Range –40°C to +125°C |
| PGA309 | Programmable Pressure Sensor Conditioner | Includes Sensor Excitation, Linearization and Temperature-Compensated Conditioning, ADC, DAC, Temp Sensor | Fully Integrated Sensor Conditioning System On a Chip (SOC), Small Package, Only 16-Bit ASSP on the Market, Included 4-20mA Transceiver | XTR108, Similar but is Targeted for PT100, Temp Sensors |
| **Data Converters** | | | | |
| ADS1256 | 24-Bit, 30kSPS ΔΣ ADC w/Multiplexer | Very Low Noise ADC with Programmable Data Rates Up to 30kSPS | Higher Data Rates, Very Low Noise | MSC1210 |
| ADS1232 | 24-bit, 80SPS, ΔΣ ADC | Very Low Noise PGA, 24-Bit ADC, Onboard Oscillator | Complete Front-End Solution for Weight Scales | ADS1244/5 |
| **Interface** | | | | |
| SN65HVD1176 | PROFIBUS RS-485 | Optimized for PROFIBUS, 2.1V min., $V_{OD}$ Low Bus Cap. | Improved Signal Fidelity and Enhanced Transmission Reliability | SN65HVD05 |
| SN65HVD251 | CAN-Bus Transceiver | Interfaces CAN-Fieldbus to System Controller | Improved Drop-In Replacement for PCA82C251, Tolerates ±200V Transients | SNHVD233 |
| **Processor** | | | | |
| MSP430F413 | 16-Bit, Ultra-Low-Power µcontroller | 8kB Flash, 256 RAM, Comparator, 96 Segment LCD | Low-Power, Integrated LCD Driver and Flash | MSP430F417 |



## 温度

温度可说是最常测量的物理参数，其测量可用不同系列的传感器实现。所有这些传感器都通过感应一些物理特征的变化推断出温度。而三种最常用的类型为热电偶、阻抗温度检测器(RTDs)、以及NTC热敏电阻。




*通用热电偶、阻抗温度检测器以及NTC热敏电阻*

**热电偶**由两根不同的金属线焊接在一起而形成2个连接点所组成。连接点间的温差使2根金属线间产生热电电位（即电压）。将基准结点保持在一个已知的温度并测定其电压差，便能推断出感应连接点的温度。热电偶具有很大的适用温度范围以及体积极小的尺寸优势。但是，其症结在于其很低的输出电压、导线回路的噪声敏感性、以及与噪声相关的高漂移量。

**阻抗温度检测器(RTDs)**的实质为绕丝线圈或缠绕薄膜，通过感应阻抗的变化来描述温度的变化。诸如铜、镍及镍铁合金都极为常用，但线性化最好，最稳定以及可重复使用的 RTD 材料则是铂金。由于其线性及无可比拟的长期稳定性，铂金 RTD 已经稳固的确立了其作为国际温度参考 转换标准的地位。尽管铂金薄膜 RTD 提供了性能匹配，但标准等级线绕电阻则在成本、外形尺寸和便利性方面更胜一筹。早期的铂金薄膜 RTD 饱受漂移的困扰，因其高表面与体积比使其对于沾染物更为敏感。而后，改进的薄膜隔离和封装消除了这些问题，使得薄膜RTD第一次实现了对线绕电阻和 NTC 热敏电阻的超越。

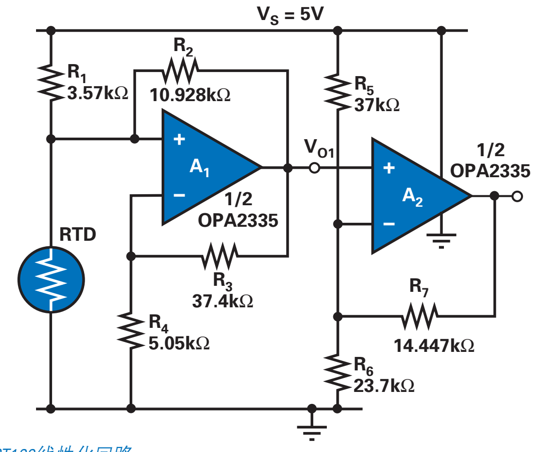
### 温度传感器属性比较

| Criteria | Thermocouple | RTD | Thermistor |
|---|---|---|---|
| Cost-OEM Quality | Low | High | Low |
| Temperature Range | Very Wide<br>–450°F to +4200°F | Wide<br>–400°F to +1200°F | Short to Medium<br>–100°F to +500°F |
| Interchangeability | Good | Excellent | Poor to Fair |
| Long-Term Stability | Poor to Fair | Good | Poor |
| Accuracy | Medium | High | Medium |
| Repeatability | Poor to Fair | Excellent | Fair to Good |
| Sensitivity (Output) | Low | Medium | Very High |
| Response | Medium to Fast | Medium | Medium to Fast |
| Linearity | Fair | Good | Poor |
| Self Heating | No | Very Low to Low | High |
| Point (End) Sensitive | Excellent | Fair | Good |
| Lead Effect | High | Medium | Low |
| Size/Packaging | Small to Large | Medium to Small | Small to Medium |

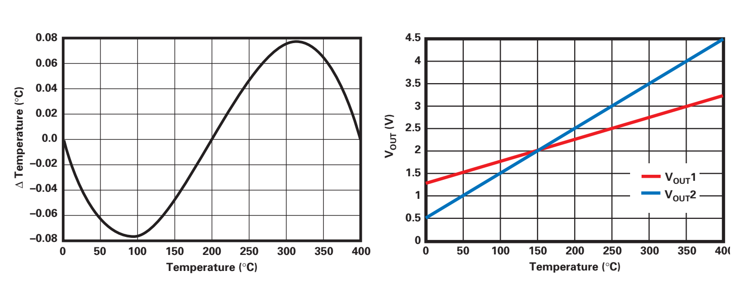
**NTC热敏电阻**由金属氧化物陶瓷组成，是低功耗、且最为灵敏的温度传感器。同时，也拥有最强的非线性以及负温度系数。热敏电阻拥有多样化的外型、 基础电阻值以及电阻温度 (R-T) 曲线，可用于简化封装及输出线性化设计。通常采用2个热敏电阻的组合来实现更好的线性输出。一般的热敏电阻具有10%-20%的互换性。虽然可提供1%的精确互换性，但所需的成本往往要高于铂金RTD。普通的热敏电阻可在限定的工作温度范围内呈现出上佳的电阻稳定性，而在较宽的温度范围内工作时则表现出中等水平的稳定性(在125℃条件下为2%/1000小时)。

### 适用于0°C至400°C的低成本PT100线性化电路

一个低成本、线性化的RTD测量回路通过一个双通道运算放大器 OPA2335 以及7个电阻即可实现。该电路的第一级在 0℃ 至 400℃ 的温度范围内对 PT100 传感器进行线性化处理，所产生的最大温度误差不超过 ±0.08℃。$R_1$确定了 RTD 的初始激励电流。$R_3$ 和 $R_4$ 设定线性化级增益以保证输入$A_1$处的输入保持在共模范围之内。$V_{01}$将随着温度的升高而升高。$V_{01}$的一小部分通过 $R_2$ 馈回输入端，用于线性化处理。通过计算得出 $R_1$-$R_4$ 的电阻值，使得通过 RTD 的最大激励电流接近 100 μV，以避免由于自发热而导致测量误差。




*OPA2335 PT100线性化回路*




温度变化与温度关系　　输出电压$V_{OUT}$与温度关系曲线



第二级实现了偏置及增益的调节。在此，$V_{01}$的线性斜率重新进行调整，在0.5V至4.5V的输出范围内为$V_{02}$提供了10mV/°C的斜率。

## 通过4-20mA电流回路实现远程3线RTD的温度测量

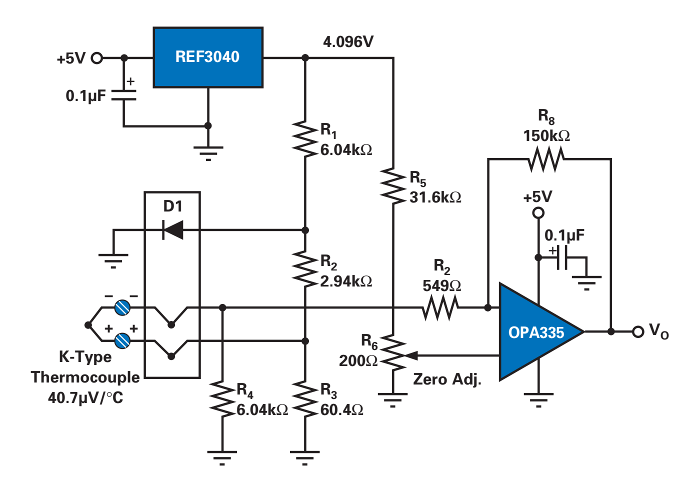
回路使用4-20mA电流发射器XTR112实现远程3线RTD的温度测量。此器件提供的2个匹配电流源用于RTD激励及线性阻抗补偿。内置线性化电路提供2阶修正项以修正RTD，从而实现了40:1的线性度改善。$I_{R1}$作为RTD的激励。$I_{R2}$作为流经$R_Z$及$R_{LINE1}$的补偿电流。通过选择$R_Z$电阻值使其与RTD最低温度下的电阻相同，内置的仪表放大器 (INA) 专用于测量仅取决于温度的 RTD 阻抗差异。

$R_{CM}$用于提供额外的压降以用于对 XTR112 的输入提供偏置，使其处于共模输入范围之内。其0.01 μF的旁路电容最小化了共模噪声。$R_G$用于设定INA增益。一部分INA输出电压通过电阻$R_{LIN1}$及$R_{LIN2}$实现反馈，以用于二阶线性化。该输出电压在内部被转换为电流，然后加至返回电流$I_{RET}$，以产生$I_O = 4mA + V_{IN} \cdot 40/R_G$的输出电流。

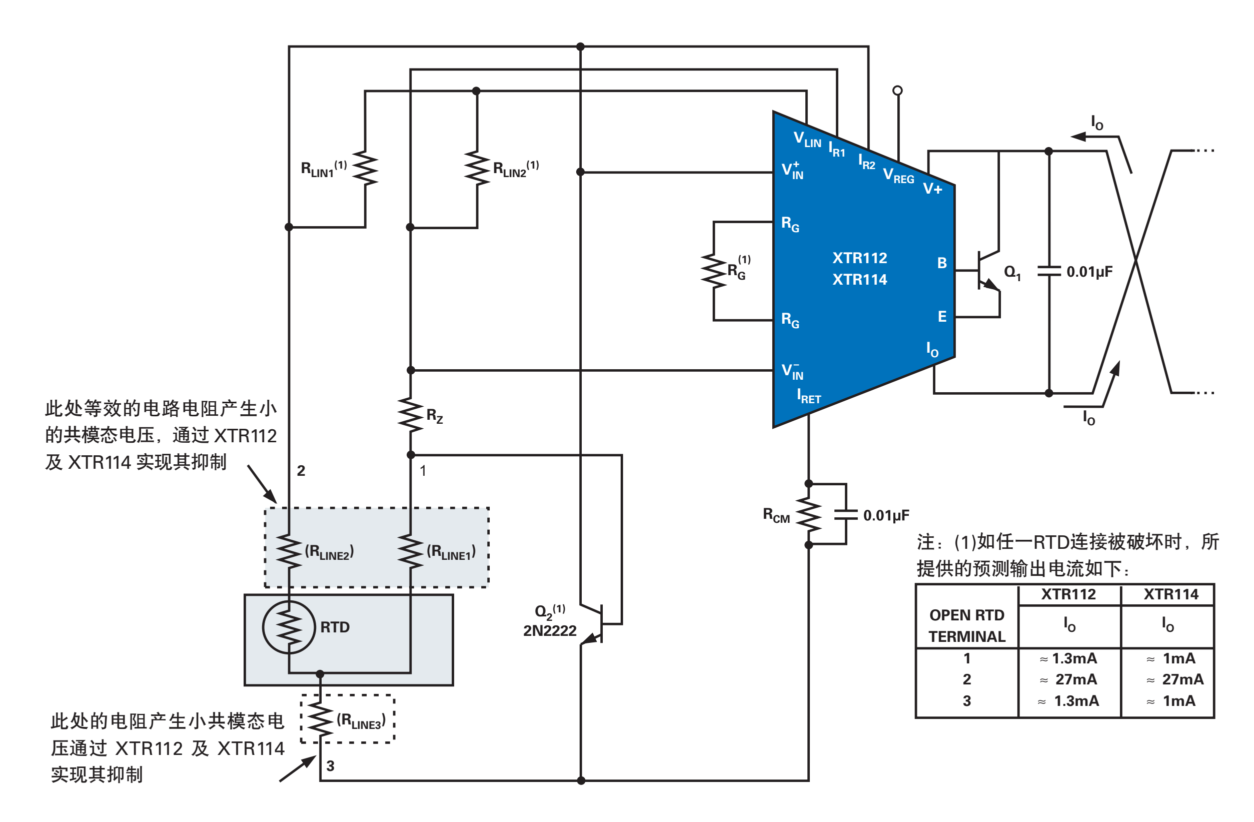
在电流环路部分，晶体管 $Q_1$ 传导绝大多数与信号相关的4-20mA 回路电流。从而将大部分功率消耗从内部高精度电路中分离出来，保持了优异的精确度。如需详细的电阻值计算信息以用于不同的温度范围，敬请参照XTR112数据表。

## 通过使用有线冷结点补偿(CJC)的K类热电偶实现温度测量

此热电偶测量电路使用自归零、单电源放大器 OPA335。精密电压参考 REF3040 提供了 4.096V 的桥接电源。二级管 $D_1$ 的前向电压具有–2mV/°C 的负温度系数，并通过 $R_1$ 至 $R_3$ 的电阻网络提供冷结点补偿。（接下页）




*OPA335温度测量电路*




| OPEN RTD TERMINAL | XTR112 $I_O$ | XTR114 $I_O$ |
|---|---|---|
| 1 | ≈ 1.3mA | ≈ 1mA |
| 2 | ≈ 27mA | ≈ 27mA |
| 3 | ≈ 1.3mA | ≈ 1mA |

*远程定位RTD温度测量*



## 温度

通过 $R_6$ 的归零调节 (zero-adjustment) 可达到规定的最低温度，同时，$R_7$ 及 $R_8$ 用于输出放大器的增益设定。OPA335提供的高直流开环增益 $A_{OL}$ 可达 130dB，从而在大增益的低电压的应用中实现了超过16位的高精确度。自动归零操作消除了1/f噪声，并提供了5μV(最大值)的初始偏置以及相对于温度仅为0.05μV/℃(最大值)的极低偏置点漂移。因此，OPA335非常适用于那些要求高准确度、低漂移和低噪声的单电源、精密型应用。

### 采用MSC1200的多热电偶用自主型温度测量系统

该温度测量系统采用混合信号控制器MSC1200来测量四种不同类型的热电偶($T_{C1}$-$T_{C4}$)的差分输出电压和参考温度。MSC1200 集成了具有22位有效精度ΔΣADC、通用型输入多路复用器、可选输入缓冲器和增益调节范围为1-128的可编程增益放大器(PGA)。该器件包括片上闪存和SRAM内存以及改良型8051-CPU(在功耗相同的情况下，其运行速度可达最初标准版本的3倍)。片上电流数字-模拟转换器(I-DAC)可提供至RTD和热敏电阻的激励电流。

### 集成电流源使能的传感器烧毁检测

在远程热电偶定位的场合，输入端RC低通滤波器将消除差分和共模噪声（当在噪声环境中工作时，热电偶的导线有可能引入这些噪声）。对于不同类型的热电偶，有可能需要采用不同的PGA设置以减小模拟输入阻抗。低输入阻抗会引发流过热电偶的补偿电流。这些电流会扰乱电子密度（塞贝克效应正是因此而产生的），从而在热电偶输出端给出错误的热电势读数。为了始终提供如一的高输入阻抗，必须启动输入缓冲器。然而，这将把输入共模范围降至比模拟地高50mV，而低于模拟电源（正极性）1.5V。为了确保热电偶信号处于该范围之内，应通过10k-100kΩ电阻器来给每个输入施加偏置电压。该偏置电压由精密电压基准电路REF3112来提供，它具有0.2%的初始误差和15ppm/℃的温度漂移。

### 冷结点补偿

冷结点补偿(CJC)是通过由AINCOM引脚读取线性化热敏电阻电路两端的输出电压来完成的。（接下页）

*多通道温度测量系统*





输入多路转换器的通用性使得能够将缓冲器的正输入和负输入分配至任何模拟输入引脚。因此，为了对参考温度进行差动测量，需将一个缓冲器输入连接至$A_{INCOM}$，而将另一个输入连接至任何热电偶的“低端”输入引脚（$A_{IN}$1、3、5或7）。然而，一旦选择了某个输入，则参考温度的所有后续差分测量都必须以同一个“低端”输入为基准。如果MSC1200靠近恒温部件且基于所需的准确度，则片上温度传感器可被用于CJC。

## INA330实现热电冷却器的恒温控制

INA330 精密型放大器设计用于在光网络和医学分析应用中进行热电冷却器 (TEC) 控制。它专为基于10kΩ热敏电阻温度控制器的使用而进行了优化。INA330 提供热敏电阻激励，并生成与输入端上的电阻差成比例的输出电压。它只采用了一个精密电阻器和热敏电阻，因而为传统的电桥电路提供了一种替代方案。这种新型拓扑结构不需两个精密电阻器，同时保持了适合于温度控制应用的绝佳准确度。INA330 在产品的使用寿命期限内始终提供极低的1/f 噪声。低失调使得-40℃至+85℃范围内的温度误差仅为0.009℃。

施加在输入端$V_1$和$V_2$上的激励电压将产生流经热敏电阻($R_{THERM}$)和精密电阻器($R_{SET}$)的电流$I_1$和$I_2$。片上电流输送电路产生的输出电流为$I_O=I_1-I_2$。该流经外部增益设定电阻器($R_G$)的输出电流在内部进行缓冲，并引至$V_O$引脚上。任何加至$R_G$另一端的偏置电压都将与输出电压相加，因此，$V_O = I_O \cdot R_G + V_{ADJUST}$。该输出电压将馈送至PID（比例、积分及微分）控制器，这个控制器向采用桥接负载配置的TEC驱动器提供输入电压。两个运算放大器(OPA569)为CMOS型、单电源功率放大器，可在采用3V电源的情况下提供高达2A的负载驱动电流。

在本应用中，受控温度由DAC来设定。如果TEC的温度升至设定温度以上，则TEC电流将单向流动，以进行冷却。如果温度降至设定点以下，则电流方向反转，TEC发热升温。图中的虚线表示从TEC至热敏电阻的闭环热反馈，两者虽然从机械上来讲是安装在一起的，但在电气上却是相互隔离的。

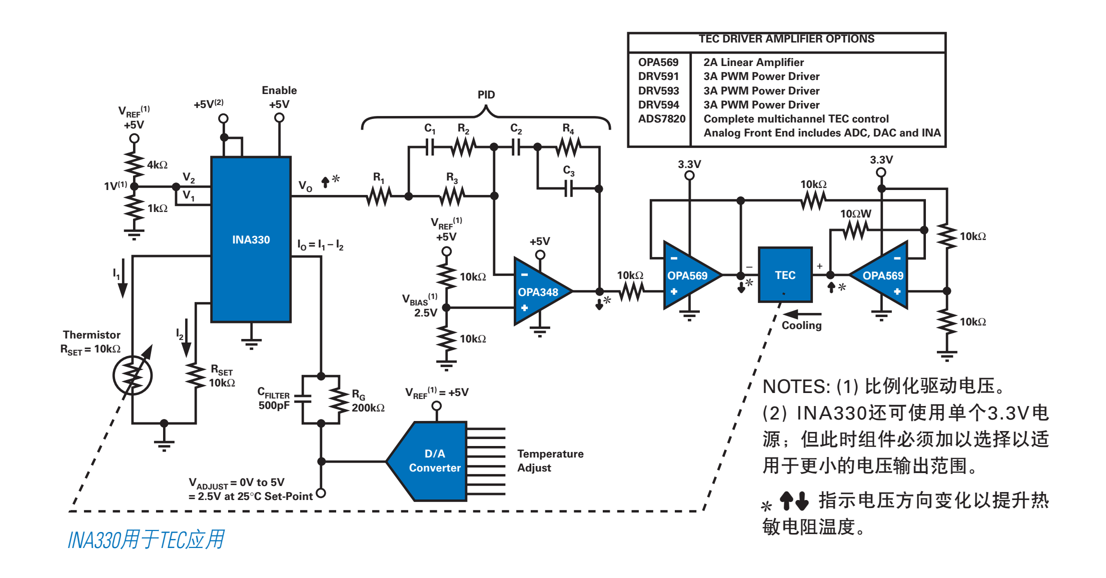
## INA326实现热电冷却恒温控制

INA326是高性能、低成本、精密型仪表放大器，具有轨至轨输入和输出。它是真正的单电源仪表放大器，具有非常低的直流误差以及扩展到正负电源轨之外的输入共模范围。这些特点使其适合于通用型至高准确度应用。

优异的长期稳定性以及超低的1/f噪声确保了低补偿电压和漂移。INA326 是两级放大器，两个增益级分别由 $R_1$和 $R_2$ 来设定。总增益由下式来描述：$G = 2 \cdot R_2/R_1$。

INA326测量温度设定点($R_7$)的电压与热敏电阻($R_{THERM}$)两端的电压之差。差分输入电压被放大100倍($G = 2 \cdot 100k\Omega/2k\Omega$)，并通过RC低通滤波器反馈至PID控制器。$R_{14}$、$C_7$组成了输出滤波器，用于实现自动修正电路并使输出噪声最小化。

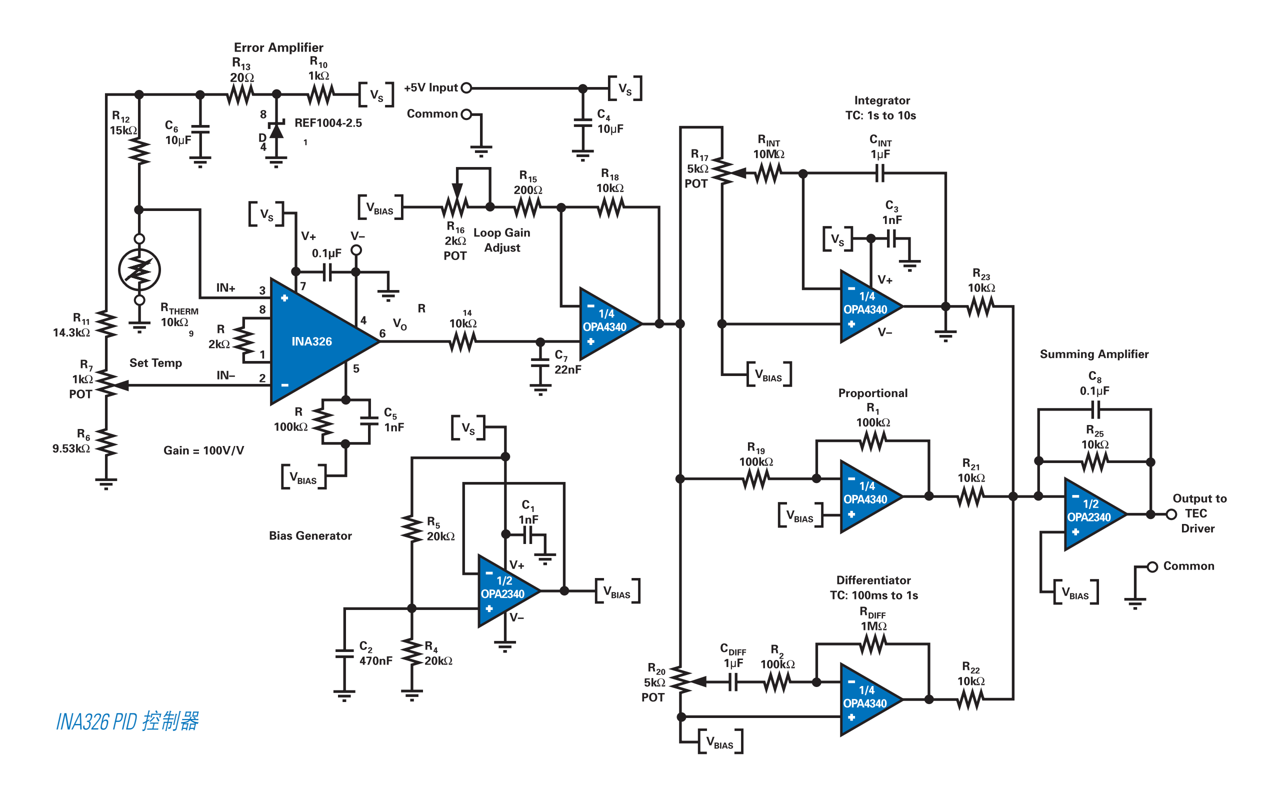
图中示出的PID控制器采用分离的调整级，允许对闭环系统控制参数作优化调整。一旦这些参数得到确定，由5 个用于PID、求和运算以及环路增益调整的运算放大器所组成的现有电路便可被转化为单放大器PID控制器。




INA330用于TEC应用



## 温度




*INA326 PID 控制器*

## 双线接口数字温度传感器
## TMP75、TMP175

敬请访问**www.ti.com/sc/device/TMP75**
及**www.ti.com/sc/device/TMP175**，以获取样片、数据表及相关应用报告。

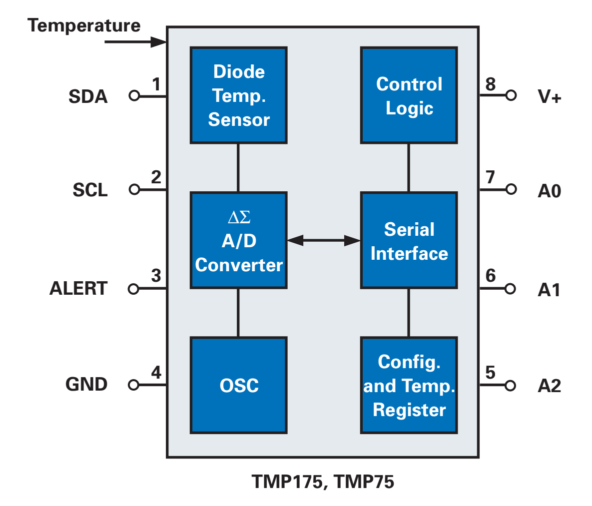
TMP75及TMP175是双线、串行输出温度传感器。此器件无需外部组件，可读取温度精确度为0.0625°C。 其双线接口与SMBus兼容，使得在一根总线上，TMP175 可支持最多27个器件，同时TMP75 可支持最多8个器件。这两款器件均具有 SMBus 报警功能，是工业环境中常见的扩展温度测量应用的理想选择。

### 主要特点

- 27个地址 (TMP175)
- 8个地址 (TMP75)
- 数字输出：双线串行接口
- 分辨率：9至12位，用户可选
- 精确度：
  ±1.5°C(最大值)，在-25°C至+85°C范围内
  ±2.0°C(最大值)，在-40°C至+125°C范围内
- 低静态电流：50 µA，0.1 µA(待机状态下)
- 宽电源范围：2.7V至5.5V
- 封装模式：SO-8封装、MSOP-8封装

### 应用

- 电源温度监视
- 电脑外设热保护
- 恒温器控制
- 环境监测及供暖(HVAC)
- 机电设备温控




*TMP175 原理框图*

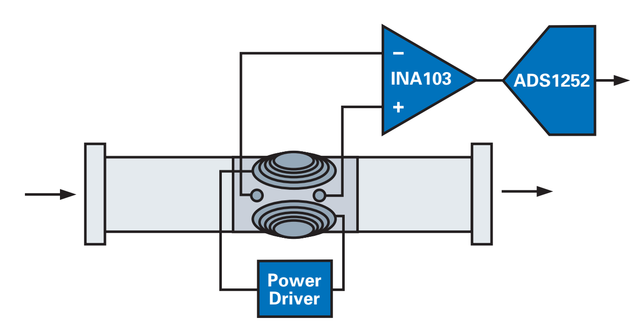
## 流量测定

工业上对流量测定的应用需求以各种形式呈现，从最低成本到最高精确度再到最快速的流量测定，且普遍存在于石油化工与制药生产上。这一章节的内容包含了对最一般技术的讲解，并给出了不同的解决方案以解决不同的流量测定难题。

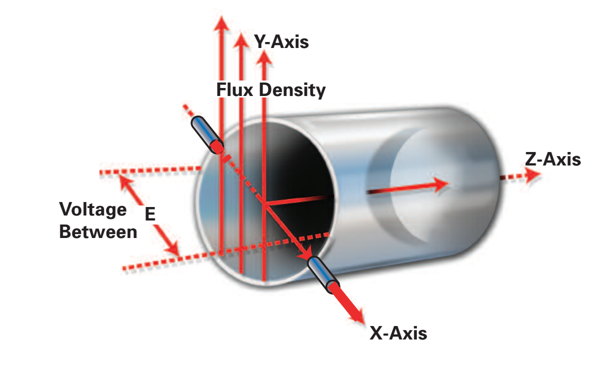
### 磁感应流量计

磁感应流量计由非铁磁体导管与磁线圈组成。导管内部绝缘表面的电极与流过导管的流体（必须是导电流体）相接触。

围绕电子管的线圈在其内部产生磁场。磁场可感应出与导管内与流体速度成正比的流体中电压。通过电极即可将这个电压测定。但由于所要测定的电压值很低，就需要设定一个诸如 INA103 的高精度、低噪音仪表放大器作为传感器的前端。而电压信号通常用精密的 ΔΣ ADCs（例如 ADS1252 ）进行数字化。




*磁感应流量计*




*磁流量计原理*

### 科里奥利流量计

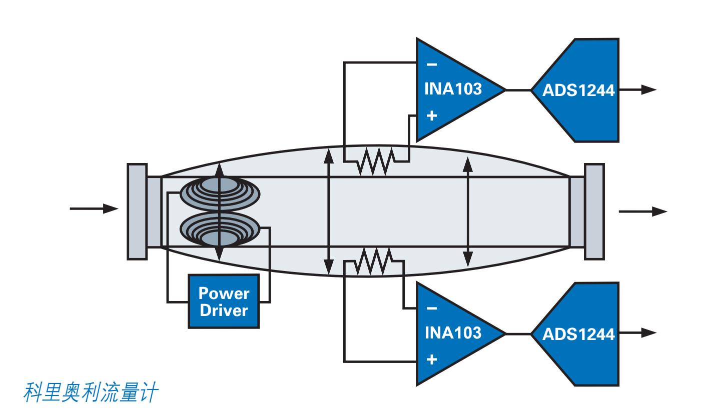
组成科里奥利流量计的导管在低频电源的驱动下产生振动。流体微粒流经导管，并由于导管的机械振荡产生偏移。此类偏移的运动表征不同，取决于与振动源位置间的距离。在接近振动源的位置，微粒得到加速。而在机械传感器的区域，微粒开始减速。在科里奥利流量计中，其机械力（不断降低）将通过感应传感器系统测量/检测。所产生的微电压将通过精确的放大器得到放大，并数字化。导管的基准振动信号与感应传感器所产生信号间的相位差用来描述导管中流量的大小。。

由于所检测的电压很小，使得一个传感器前端的低噪音、高精确度放大器成为必须。而为了数字化测量的信号，则需要一个双通道精确ADC（ΔΣ），正是双通道间的相位准确度直接影响了测量的精确度。

### 两种测量技术间的差异

磁感应系统仅能测量流经导管的流体速度。在导管的直径得知的情况下，流体的体积便可计算得出。而流体必须拥有小电阻。非导电液体无法被测量。

科里奥利技术实现了对流经导管的液体质量的实际测量。但这项技术的成本较高。

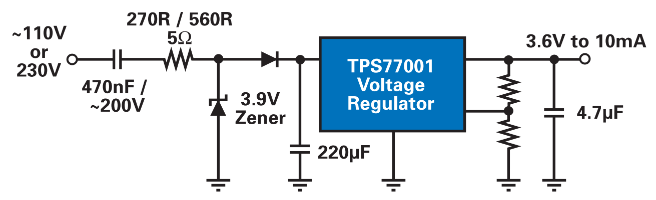



*科里奥利流量计*

*科里奥利流量计工作原理.*

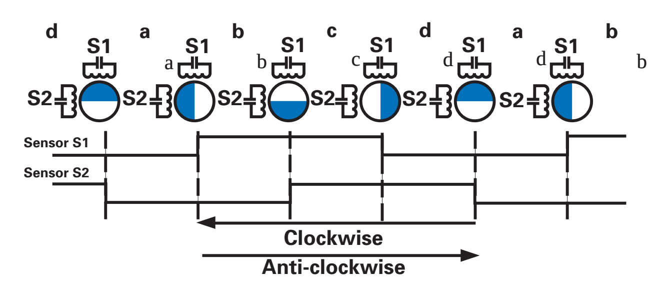
## 流量测定

### 低成本方法：




TPS7701原理框图

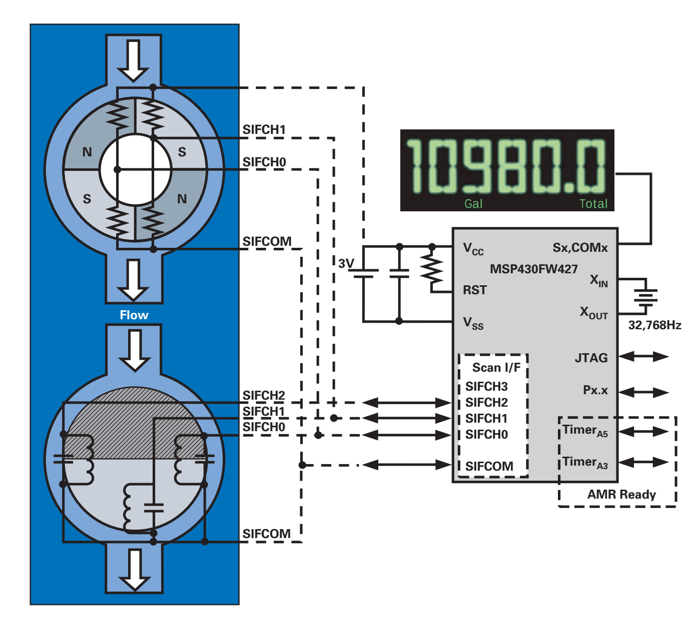
- 对于全部的测量应用，超低功耗 MSP430 所需电流 <10mA
- 无需采用电源变压器来进行电源管理
- 电容器抽头电源与LDO的简单耦合




正交解码、检测旋转、方向误差检测

正交解码实例：采用两个LC型传感器$S_1$和$S_2$来生成输入信号。如果已知阻尼板此前的位置和电流状态，则可检测旋转以及旋转的方向。对于数字信号，“0”表示传感器位于阻尼板的欠阻尼部分之上，而“1”则表示其位于阻尼区(金属部分)之上。可以采用额外的传感器作为备份，但两个传感器足以满足旋转和方向检测之需。

### 高精度解决方案：




MSP430FW427单芯片流量表

- 采用两个LC传感器或一个GMR传感器($S_1$、$S_2$)
- 启动扫描I/F的状态机，以检测旋转、误差和失真
- 由于扫描I/F的缘故，因此采用小容量电池即可满足两个校准周期的使用期限要求
- 可处理不同的传感器和物理条件
- 面向附加功能(比如低功耗条件下的自动读表)的性能

## 器件推荐

| Device | Description | Key Features | Benefits | Other TI Solutions |
|---|---|---|---|---|
| **Reference** | | | | |
| REF3140 | Voltage Reference | Drift = 20ppm/°C 4.097V, 0.2% | Very Low Drift, Tiny Package | REF02, REF102 |
| **Isolation Products** | | | | |
| DCV010515D | Dual Converter | Isolation Converter, +$5V_{IN}$, ±$15V_{OUT}$ | Low Noise, Small Board Data | DCP10515 |
| DCV0105052D | Dual Converter | Isolation Converter, +$5V_{IN}$, ±$5V_{OUT}$ | Low Noise, Small Board Data | DCP10505 |
| **Power Management Products** | | | | |
| TPS54110 | SWIFT™ Buck Controller | Adjustable Output (0.9V-3.3V), 1.5A | Very Easy to Use, Flexible Output | TPS64200 |
| **Data Converters** | | | | |
| ADS8321 | 16-Bit, 100kSPS | Power = 2mW, 8-pin, SFDR = 86dB | Excellent Performance | ADS8320, ADS8325 |
| ADS1251 | 24-Bit, 20kSPS | Small (8-Pin SSOP) and Easy to Use (Read Only Interface) | Only 7.5mW, Single 5V Supply | ADS1252 |
| ADS1271 | 24-Bit, 105kSPS | AC Performance, DC Accuracy | Measure Up to 50kHz Bandwidths, Easy to Synchronize Multiple Converters | PEM4202 |
| MSC121x | 24-Bit ADC, MCU, REF DAC, PGA | 8051 MCU with Integrated 24-Bit Up to 1kSPS ADC, 16-Bit DACs and Precision Reference, Eight Inputs and PGA | Cost Effective and Highest Integration All in a Single-Chip Solution | MSC1212, MSC1200 |



## 线性电压差分转换器

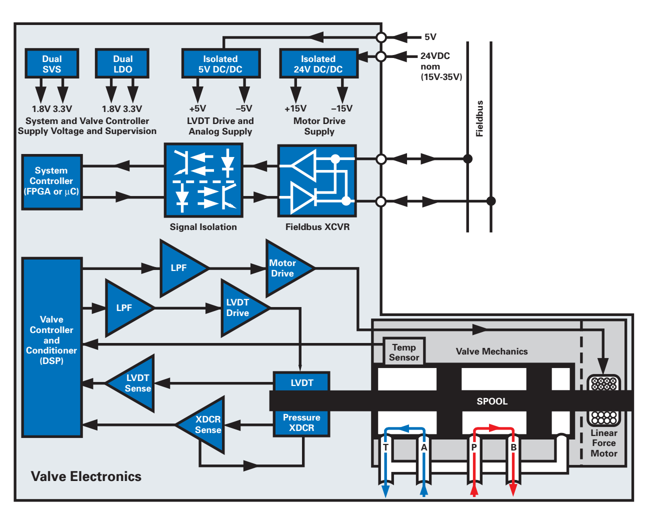
液压阀用于将液态介质 (最常见的是油) 流从输入端口引导至输出端口。流向取决于由线性电动机驱动的转轴。液压阀电子系统被分为三个核心子系统：

电源转换 — 用于在阀门电源与外部现场总线和 24V 辅助电源之间提供电隔离。它还为各个独立的功能模块提供规定的电源电压。

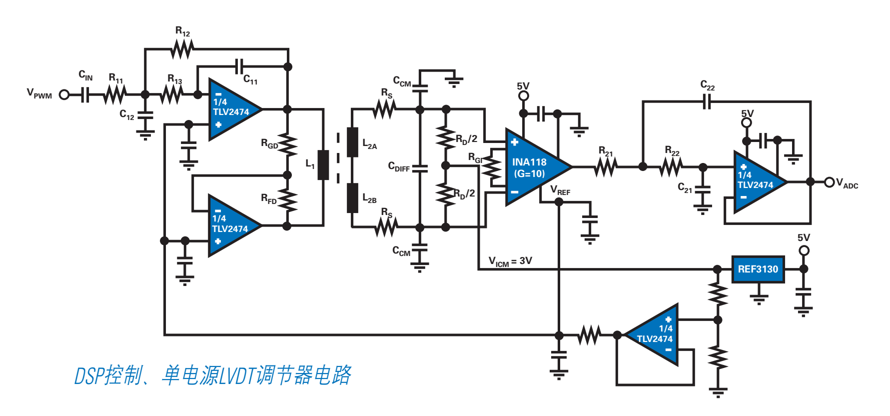
场总线接口和控制 — 用于在系统控制器与场总线信号之间提供电隔离。系统控制器将来自现场总线的输入数据转换为用于DSP的阀门操作命令，反之，它也把来自DSP的阀门数据转换为现场总线信号。

阀门控制 — 完成转轴的定位以及压力和温度测量。它还指示报警条件。

阀门控制器通过系统控制器接收来自现场总线的定位命令，并驱动线性加力电机，直到位置传感器 （LVDT = 线性可变差分变压器）的输出信号与定位命令的输入值相等为止。同时对压力和温度进行监测。如果这些传感器中有一个检测到相应的物理参数超过了预定的安全值，则将显示报警状态。




基本液压阀示意图




DSP控制、单电源LVDT调节器电路

## 器件推荐

| Device | Description | Key Features | Benefits | Other TI Solutions |
|---|---|---|---|---|
| **Power Management Products** | | | | |
| UCC3823 | PWM Controller | Universal PWM Controller for 24V, Isolated Boost Converter | Lowest Cost, Small Package | UCC3813, TL5001 |
| DCR010505 | 1W/5V DC/DC Converter | Miniature 5V DC/DC Converter with 100V Galvanic Isolation, Integrated 5V LDO | Fully Integrated DC/DC Converter in Miniature Package, High Isolation and Regulated Output | DCP020505 (2W, Unregulated) |
| TPS70751 | Dual LDO: 3.3V/1.8V | Two Regulated Output Voltages for DSP Split-Supply Systems with Power-Up Sequencing, 250mA Output Current | Industry's Most Integrated Supply Systems, with Power Good Indicator, UVL and Thermal Shutdown | TPS70851, TPS70251 |
| TPS3305-18 | Dual SVS: 3.3V/1.8V | Dual Supervisory Circuit for DSP and Processor Supplies Including POR Generator | Requires No External Capacitors, Temp-Compensated $V_{REF}$, Small Package | TPS3306-18, TPS3806I33 |
| **Amplifiers** | | | | |
| OPA4345 | Quad, Low-Power Op Amp | Used as Active Low-Pass Filter to Convert PWM into Analog Signal | Low Power, Low Offset, Small Package, Low Cost | OPA4340, OPA4346 |
| TLV2472 | Dual, Single-Supply, High O/P Drive | Drives LVDT Sensor with ±25mA | No Cross-Over Distortion in BTL Configuration, Lowest Supply Voltage, Drives Up to ±35mA | TLC074, TLC084 |
| INA118 | Single/Dual Supply Inst. Amp | Senses LVDT Output with High Linearity | High Linearity at Lowest Supply Voltage | INA128 |
| OPA544 | Power Amplifier | Drives Linear Force Motor (±10V/1A) | Class AB amp with Current Limit and Thermal Shutdown | OPA548, OPA549, OPA569 |
| PGA309 | Programmable Pressure Sensor Conditioner | Includes Sensor Excitation, Linearization and Temperature-Compensated Conditioning | Fully Integrated Sensor Conditioning System on a Chip (SOC), Small Package | — |
| TMP121 | Digital Temp Sensor | Integrates Diode Temp Sensor, ΔΣ ADC and SPI Interface to Convert Valve Temp into Digital Code for the DSP | High Resolution and Accuracy, Extended Industrial Temp Range, Ultra Small Package | TMP175 (SMBus Interface) |
| DRV1xx | Low-/High-Side Monitoring | Fixed/Adjustable Switching Frequency , 1.2A Output, Wide Supply | Ideal for Driving Electromechanical Devices | DRV590, DRV591 |
| **Interface** | | | | |
| SN65HVD1176 | PROFIBUS Transceiver | Interfaces PROFIBUS Fieldbus to System Controller | Optimized for Bus, Up to 160 Users Per Bus, Up to 40Mbps, Benchmarked by Siemens as Reference Device | SN65HVD485E |
| SN65HVD251 | CAN-Bus Transceiver | Interfaces CAN Fieldbus to System Controller | Improved Drop-In Replacement for PCA82C251, Tolerates ±200V Transients | SNHVD233 (3.3V Version) |

## 电流测量

电流是工业应用中最常见的测量值之一。“电机控制”章节（第20-23页）描述了采用同样需要电隔离的ΔΣ调制器和精密型SAR ADC（逐次逼近式ADC）来进行的精密电流测量。另一种直接测量电流的方法是采用仪表放大器，它能够在共模电压高达60V的条件下直接进行分流测量。

### 高端分流监控器
### INA138、INA168、INA170

敬请访问**www.ti.com/sc/device/INA138**、**www.ti.com/sc/device/INA168**、**www.ti.com/sc/device/INA170**以获取样片和数据表。

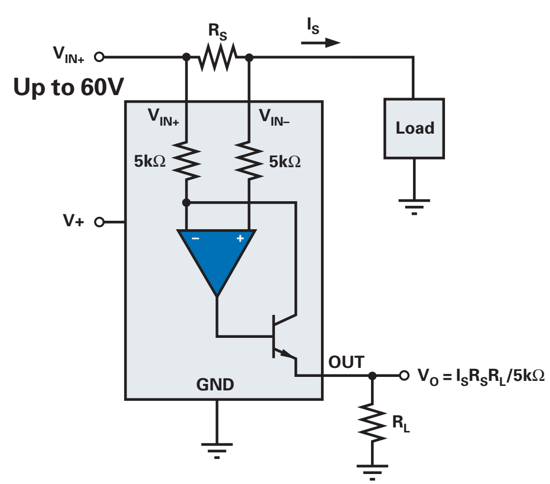
INA138 和 INA168 是高端、单极型分流监控器，具有低静态电流、采用 SOT23-5 封装。输入共模电压和电源电压是独立的，并可在 2.7V 至 36V (INA138) 或 2.7V 至 60V (INA168) 的范围内调节。这些器件将差分输入电压转换为电流输出。使用的外部负载电阻器能把该电流重新转换为电压，并可设定成 1 至 100 以上增益。

#### 主要特点

- 宽电源范围：
  - INA138：2.7V至36V
  - INA168：2.7V至60V
- 单向电流：INA138/9、INA168/9
- 双向电流：INA170
- 低静态电流：25μA
- 独立电源和共模电压
- 宽温度范围：-40℃至+125℃
- 封装模式：SOT23-5封装

#### 应用

- 车载、电话和计算机中的分流测量
- 便携式和备用电源系统
- 电源管理
- 精密电流源




*INA138, INA168原理框图*

### 具有-16V至+80V共模范围的分流监控器
### INA193、INA194、INA195、INA196、INA197、INA198

敬请访问**www.ti.com/sc/device/PARTnumber**，以获取样片和数据表。（**PARTnumber**可用**INA193**、**INA194**、**INA195**、**INA196**、**INA197**或**INA198**替代）

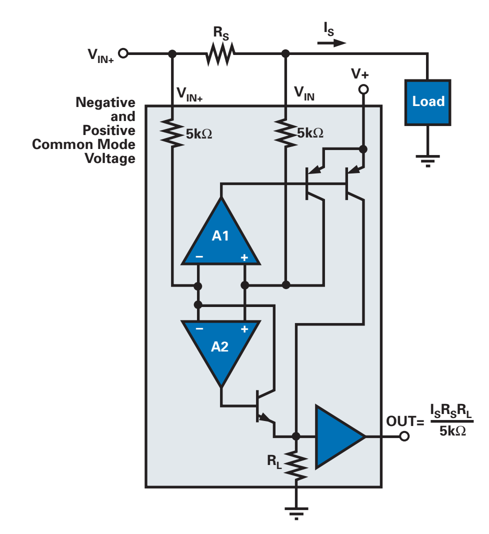
具有电压输出的INA193-INA198系列分流监控器能够在-16V至+80V的共模电压范围内检测分流电阻器两端的压降，而不受电源电压的影响。这些器件可提供三种输出电压标度：20V/V、50V/V和100V/V。400kHz带宽简化了在电流控制环路中的使用。

#### 主要特点

- 共模电压范围：-16V 至+80V
- 高精确度：±3%(在整个工作温度范围内)
- 带宽：高达400kHz
- 静态电流：250μA
- 可提供三种转换方式：20V/V、50V/V、100V/V
- 封装型式：SOT23封装

#### 应用

- 汽车、电话和计算机中的分流测量
- 便携式和备用电源系统
- 电源管理
- PWM电流控制环路
- 16位、单通道、±250mV输入范围：ADS1202
- 16位、单通道、±250mV输入范围：ADS1203
- 16位、四通道、0V至5V输入范围：ADS1204




*INA19x原理框图*



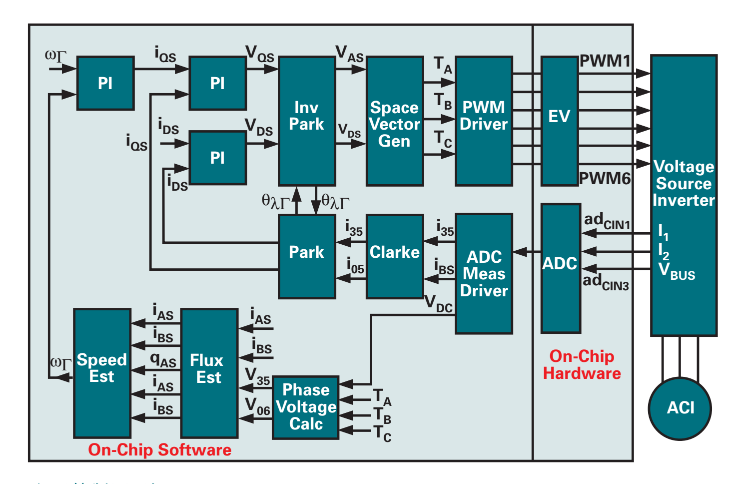
## 数字电机控制

当今的电机控制应用向电子电路提出了最高效率、最低功耗和最高精度控制等诸多挑战。电机有多种类型，其中数字和模拟解决方案将起着提升电机控制应用性能的作用。同步电机也被称作 BLDC（无刷直流电机）或 PMSM（永磁同步电机）。它们之间的唯一差别在于感应电压的波形，这是由于采用了两种不同的定子线圈绕线方式所致。反向电动势波形在 BLDC 电机中呈现梯形，而在PMSM电机中则是正弦波形的。C2000™ DSP 控制器所采用的数字技术使得能够为各种类型的电机选择正确的控制技术。DSP 的处理能力可使机器发挥其最佳性能，并降低系统成本。可选方案包括采用传感器需要量较少的技术来降低传感器成本（甚至无需传感器）；此外，复杂算法的运用也能够对简化机械驱动传动装置设计有所帮助，同样可实现系统成本的削减。

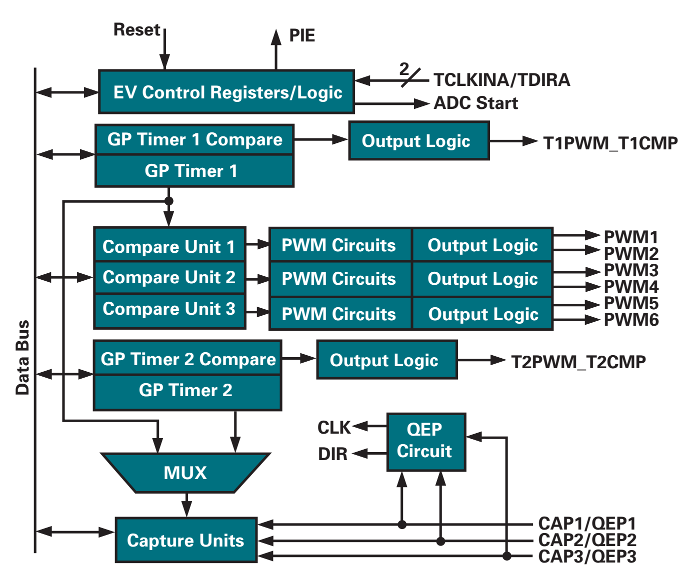
对于异步电机，调速是具有代表性的问题。变速驱动应用中普遍使用的是采用 6 PWM 配置的三相逆变器。根据应用的不同，可以选用无需反馈的简单 V/Hz 开环（标量）控制或需要电流、电压和速度信息的矢量控制。

标量控制：(V/Hz)
- 易于实现：只需向电机馈送三个正弦波
- 无需位置信息(任选)：
  - 未提供优良的动态性能
  - 扭矩输出并未针对所有的速度进行优化

矢量控制 (亦称“面向场的控制”) 使得设计师能够满足所有的“理想”控制要求。由于DSP集成及其处理性能 (MIPS) 实现了实时控制，因此，一旦获知了所有的系统参数（比如电流相位和总线电压），便可在恰当的时刻提供合适的功率。



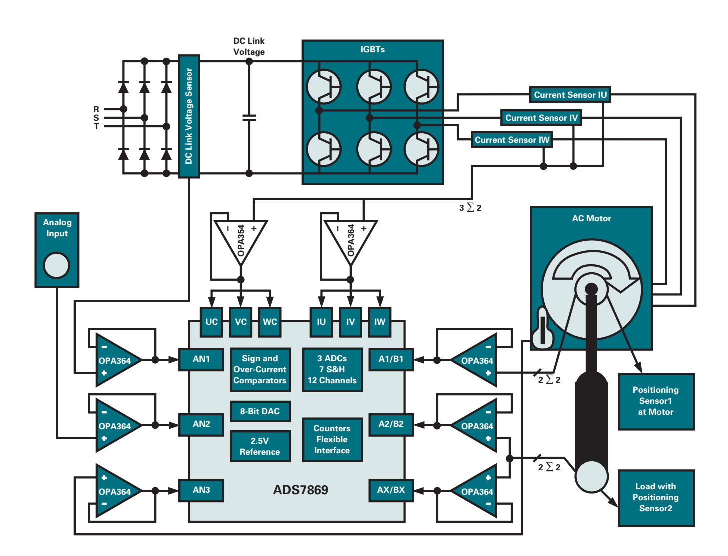

*矢量控制原理框图*




*TMS320F2810原理框图*

## 伺服电机控制应用及重点产品

下图为典型的电机控制电路。IU、IV 和 IW 通道负责测量电机的电流。电机的位置/速度和负载由 Ax、Bx 等利用解算器或模拟编码传感器来同步测量。为获得最高的电机定位准确度，同时实现对至少两个电流（或全部三个电流）的进行采样是至关重要的。ADC 必须具有上佳的线性和低偏置。通道$A_{N1}$用于测量差分DC链路电压。快速采样（每个通道的采样时间约 2 μs 或更短）可用于确保IGBT控制的快速漏电流检测。$A_{N3}$ 测量电机的温度。窗口比较器的电平输入被连接至一个用于控制的8位 DAC。




*伺服电机控制原理框图*

## 异步、直流及伺服电机

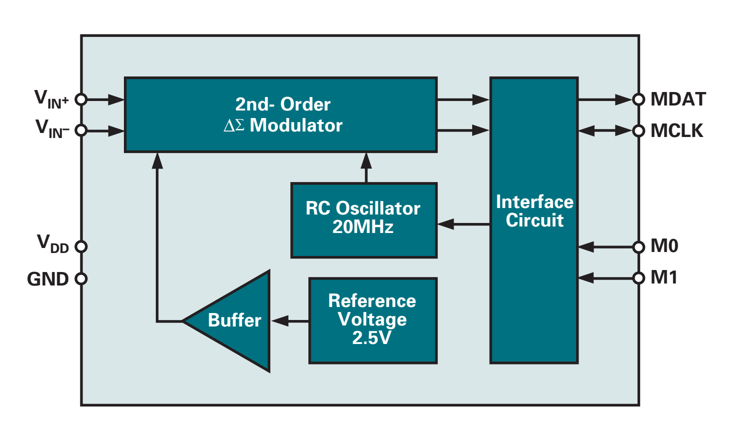
### 分流调制器
### ADS1203

敬请访问www.ti.com/sc/device/ADS1203，取样片、数据表及评估板。

ADS1203 是具有 95dB 动态范围、采用一个单独的 +5V 电源工作的 ΔΣ 调制器。差分输入是实现与变换器或低电平信号的直接连接的理想选择。采用8引脚 TSSOP 封装或16引脚 QFN (3 × 3) 封装。

#### 主要特点
- 分辨率：16位
- 输入范围：±250mV
- 线性度：±1LSB(典型值)
- 2.5V内部基准

#### 产品家族成员：
- 16位、单通道、±250mV输入范围：ADS1202
- 16位、单通道、±250mV输入范围：ADS1203
- 16位、四通道、0V至5V输入范围：ADS1204
- 16位、双通道、0V至5V输入范围：ADS1205
- 16位、单通道、±100mV输入范围：ADS1208
- INA139：高端分流监控器(差分放大器)，高达36V的共模输入
- INA169：高端分流监控器(差分放大器)，高达60V的共模输入




ADS1203原理框图

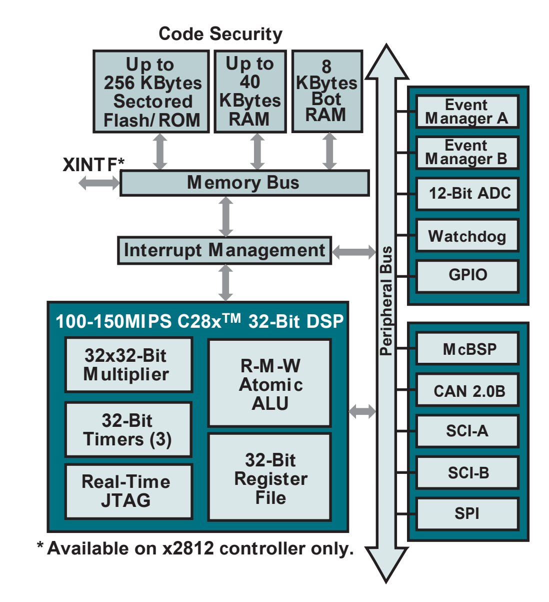
### 控制器系列，定点型
### TMS320C28x™

敬请访问www.ti.com/c2000，以获取样片、数据表、工具及相关应用报告。

C28x™系列控制器是业界首个基于控制的32位DSP，带片置可重复编程闪存、出厂前已经装载程序的 ROM、或高性价比RAM（仅作为内存选项），性能可达100-150MIPS。

#### 规格
- 32位、定点 C28x DSP内核
- 工作性能最高可达 150-MIPS
- 1.8/1.9V核心及3.3V外设
- 易用的软件及开发工具，用于加速产品面市

#### 应用
- 数字电机控制
- 数字电源
- 先进的工业传感、车载、医药及消费市场




TMS320F2812 控制器方框图

## 2＋2通道同时采样、16位ADC
## ADS8361

敬请访问**www.ti.com/sc/device/ADS8361**，以获取样片、数据表及评估板。

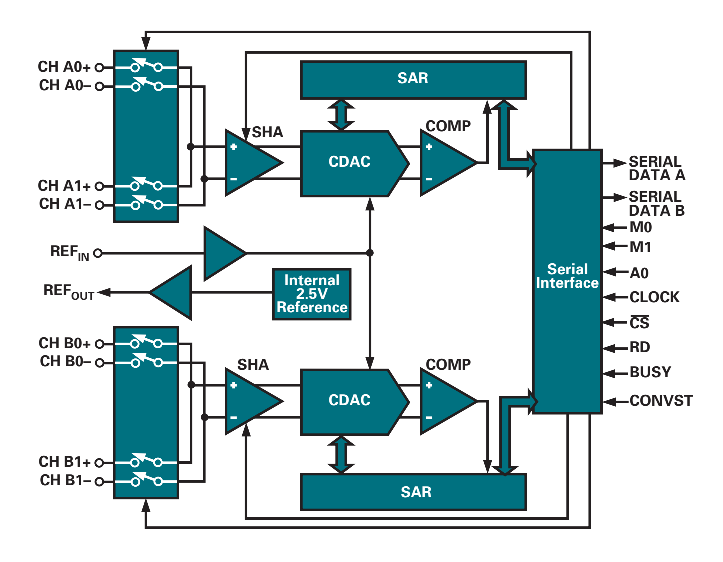
ADS8361是16位、500kSPS ADC，具有四个全差分输入通道(分为两对)，可用于高速、同步信号采集。该器件提供了高速、双串行接口，采用SSOP-24封装，并针对-40°C至+85°C的工作范围拟订了技术规格。

### 主要特点

- 四个全差分输入通道
- 2μs吞吐每通道
- 积分线性误差(INL)：±3 LSB(典型值)
- 功耗：150mW
- 2.5V内部基准
- 电源电压：2.7V至5.5V
- 引脚兼容，可升级到 ADS7861（12位至16位）

### 产品家族成员

- 12位、2×2通道、串行接口：ADS7861
- 12位、2×2通道、并行接口：ADS7862
- 12位、3×2通道、串行接口：ADS7864
- 16位、2×2通道、串行接口：ADS8361
- 16位、6×1通道、并行接口：ADS8364




*ADS8361原理框图*

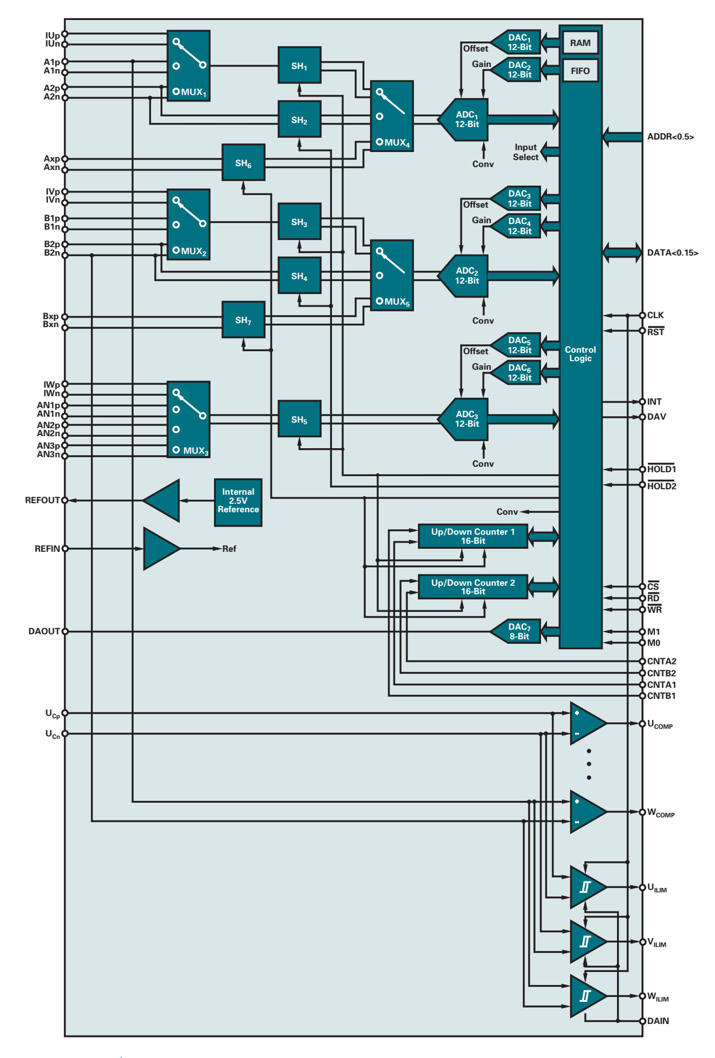
## 完全的模拟前端
## ADS7869

敬请访问**www.ti.com/sc/device/ADS7869**，以获取样片、数据表及评估板。

ADS7869是著名的VECANA01模拟前端的下一代继任产品，包括三个 ADC，总共有7个 S/H 电容器以及12个全差分输入通道。有4个符号比较器与4个输入通道相连。该器件提供了非常灵活的数字接口，具有三种不同的模式，从串行SPI、可调并行、一直到VECANA01 兼容型模式。硅芯片上还增设了两个加法/减法可逆计数器 (up-down counter)，用于进行位置传感器分析。该功能可确保编码器的模拟输入与计数器的值同步。

### 主要特点

- 分辨率：12位
- 采样速率：1MSPS
- 积分线性误差：±1LSB(典型值)
- 2个片上加法/减法可逆计数器模块
- 功耗：250mW
- 封装型式：TQFP-100封装



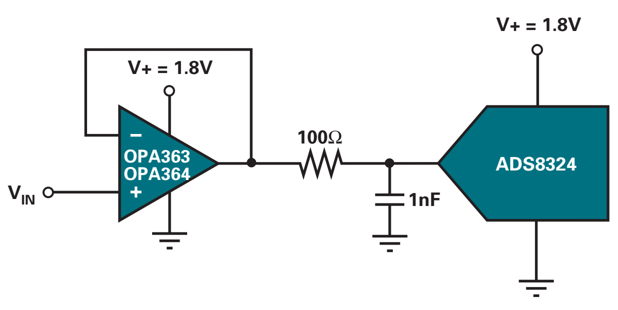

*ADS7869原理框图*

## 异步、直流及伺服电机

### 1.8V、7MHz、90dB CMRR（共模抑制比）轨至轨I/O运算放大器
### OPA363、OPA364

敬请访问www.ti.com/sc/device/OPA363
及www.ti.com/sc/device/OPA364，以获取样片、数据表及评估板。

OPA363和OPA364系列是专为低电压、单电源操作而优化的高性能CMOS运算放大器。这些专为采用1.8V(±0.9V)至5.5V(±2.25V)的单工作电源而设计的放大器是电池供电型系统中的传感器放大以及信号调节的理想选择。此器件专为驱动中等速度(最高100kHz)的A/D转换器进行了优化，并提供了卓越的CMRR，而无需采用传统的互补输入级中常见的交叉通路。输入共模范围包括正负电源，电源轨输出电压摆幅在的10mV以内。所有器件版本均针对-40°C至+125°C的工作范围拟订了技术规格。




*OPA363原理框图*

#### 主要特点
- 转换速率：5V/μs
- 低失调：500μV(最大值)
- 静态电流：750μA/通道(最大值)
- 可提供单通道、双通道和四通道版本
- 封装型式：SOT23-5封装、SO-8封装、MSOP-8封装、TSSOP-14封装、SO-14封装

#### 应用
- 信号调节
- 数据采集
- 流程控制
- 测试设备
- 有源滤波器

### 器件推荐

| Device | Description | Key Features | Benefits | Other TI Solutions |
|---|---|---|---|---|
| **Amplifiers** | | | | |
| OPA335 | Zero-Drift Op Amp | 0.05µV/°C Drift, 5µV Offset, RRIO at 3.3VDC, Single Supply | Best Long-Term Stability for Industrial Use, No Need for Dual Supply, Best in Class, Automotive Temp Range | OPA735, 12V Version with Improved Noise and Drift |
| INA326 | High-Precision Instrumentation Amp | 30nV/√Hz Noise, RRIO, Single Supply | Lowest Noise in the Industry and Best Long-Term Stability, No Need for Dual Supply | INA337, Automotive Temp Range, –40°C to +125°C |
| TMP121 | Digital Temp Sensor | Integrated Diode Temp Sensor, ΔΣ ADC and SPI Interface to Convert Valve Temp into Digital Code or the DSP | High Resolution and Accuracy, Extended Industrial Temperature Range, Ultra Small Package | TMP175 (SMB-Bus Interface) |
| OPA227 | Low Noise Amp | $V_N$ = 3nV, CMRR > 120dB, $V_S$ = 5 to 36V | Very Low Noise, Small Package | OPA350, OPA725 |
| **Interface** | | | | |
| SN65HVD1176 | PROFIBUS Transceiver | Interfaces PROFIBUS Fieldbus to System Controller | Optimized for PROFIBUS, Up to 160 Users Per Bus, Up to 40Mbps | SN65HVD485E, Low-Cost Version |
| SN65HVD251 | CAN-Bus Transceiver | Interfaces CAN-Fieldbus to System Controller | Improved Drop-In Replacement for PCA82C251, Tolerates ±200V Transients | SNHVD233 (3.3V Version) |
| **Power Management Products** | | | | |
| REF3140 | Voltage Reference | Drift = 20ppm/°C, 4.097V, 0.2% | Very Low Drift, Tiny Package | REF02, REF102 |
| DCV010505D | Dual Converter | Isolation Converter, +5$V_{IN}$, ±5$V_{OUT}$ | Low Noise, Small Board Area | DCP010505 |
| TPS54110 | SWIFT™ Buck Converter | Adjustable Output (0.9V to 3.3V), 1.5A | Very Easy to Use, Flexible Output | TPS64200 |
| **Data Converters** | | | | |
| ADS1206 | V/F Converter | 0-5V Input, 1-4MHz Output | Low Cost Direct DC-Link Current Measurement | INA19x, INA138 |
| DAC7731 | 16-Bit, 5µs Settling Time | Output = ±10V, INL = 0.0015% | Small Package | DAC7741 |
| **Other** | | | | |
| FilterPro™ | Free Design Software | Design Low Pass Filters, Quick, Easy | Free, www.ti.com/filterpro | — |



## TMS320C28x™控制器系列

| Device[§] | MIPS | Boot ROM | RAM | Flash/ ROM | Timers | CAP/ QEP | # PWM Channels | # Hi-Res PWM | 12-Bit A/D Chs/ Conversion Time (ns) | EMIF | WD Timer | Comm Ports Other | SPI | SCI | CAN | I/O Pins | Core Voltage (V) | Packaging | ($U.S.)[†] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Flash Devices** | | | | | | | | | | | | | | | | | | | |
| TMS320**F2801**-PZA/S/Q[§] | 100 | 8KB | 12KB | 32KB | 9 | 2/1 | 6 + 2 | 3 | 16Ch/160 | — | Y | $I^2C$ | 2 | 1 | 1 | 32 | 1.8 | 100-LQFP | $5.79 |
| TMS320**F2801**-GGMA/S/Q[§] | 100 | 8KB | 12KB | 32KB | 9 | 2/1 | 6 + 2 | 3 | 16Ch/160 | — | Y | $I^2C$ | 2 | 1 | 1 | 32 | 1.8 | 100-BGA | $5.79 |
| TMS320**F2806**-PZA/S/Q[§] | 100 | 8KB | 20KB | 64KB | 15 | 4/2 | 12 + 4 | 4 | 16Ch/160 | — | Y | $I^2C$ | 4 | 2 | 1 | 32 | 1.8 | 100-LQFP | $8.69 |
| TMS320**F2806**-GGMA/S/Q[§] | 100 | 8KB | 20KB | 64KB | 15 | 4/2 | 12 + 4 | 4 | 16Ch/160 | — | Y | $I^2C$ | 4 | 2 | 1 | 32 | 1.8 | 100-BGA | $8.69 |
| TMS320**F2808**-PZA/S/Q[§] | 100 | 8KB | 36KB | 128KB | 15 | 4/2 | 12 + 4 | 4 | 16Ch/160 | — | Y | $I^2C$ | 4 | 2 | 2 | 32 | 1.8 | 100-LQFP | $11.52 |
| TMS320**F2808**-GGMA/S/Q[§] | 100 | 8KB | 36KB | 128KB | 15 | 4/2 | 12 + 4 | 4 | 16Ch/160 | — | Y | $I^2C$ | 4 | 2 | 2 | 32 | 1.8 | 100-BGA | $11.52 |
| TMS320**F2810**-PBKA/S/Q[§] | 150 | 8KB | 36KB | 128KB | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $13.81 |
| TMS320**F2811**-PBKA/S/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $14.73 |
| TMS320**F2812**-GHHA/S/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 179-BGA | $15.65 |
| TMS320**F2812**-PGFA/S/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 176-LQFP | $15.65 |
| **RAM-Only Devices** | | | | | | | | | | | | | | | | | | | |
| TMS320**R2811**-PBKA/Q[§] | 150 | 8KB | 40KB | — | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $ 9.11 |
| TMS320**R2812**-GHHA/Q[§] | 150 | 8KB | 40KB | — | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 179-BGA | $10.63 |
| TMS320**R2812**-PGFA/Q[§] | 150 | 8KB | 40KB | — | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 176-LQFP | $10.63 |
| **ROM Devices** | | | | | | | | | | | | | | | | | | | |
| TMS320**C2810**-PBKA/Q[§] | 150 | 8KB | 36KB | 128KB | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $7.05[✦] |
| TMS320**C2811**-PBKA/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $8.22[✦] |
| TMS320**C2812**-GHHA/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 179-BGA | $9.59[✦] |
| TMS320**C2812**-PGFA/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 176-LQFP | $9.59[✦] |

[†] *报价单位为美元，此处为2006年的建议零售价。所有的价格都有可能改变。在此建议客户在下订单前先从TI获取最近的完整价格信息。TI会在接受订单前核实最终价格。*

[✦] *F C281x器件的最小批量为10KU，非重复性工程费用(NRE)为11,000美元。*

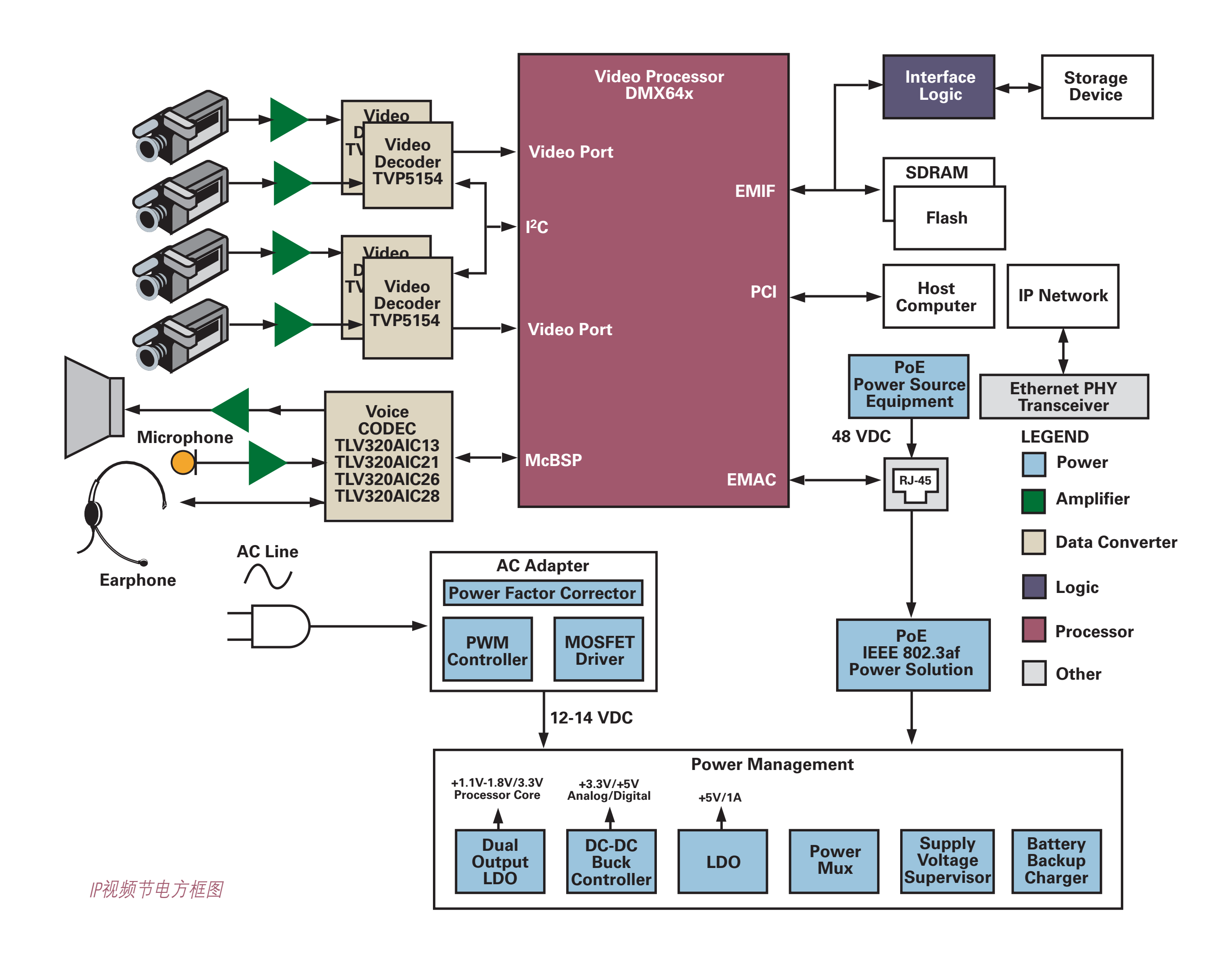
[§] *A=-40°至85°C；S=-40°至125°C (较A需加价10%)；Q =-40°至125°C, 符合Q100标准(较S需加价15%)*

*所有器件均可提供无铅绿色封装版本。*

## 监控摄像机、玻璃裂损、烟雾检测

### 监控IP视频节点基础

数字视频监控系统具有嵌入式图像捕获能力，这使得能够对视频图像或提取的视频信息进行压缩、存储或通过通信网络或数字数据链路进行传输。TVP51xx 视频解码器系列提供了高性能、低成本模拟视频接口，可支持 PAL/NTSC/SECAM 视频系统。快速锁定时间和超群的模拟处理能力使其成为任何一种流视频应用的理想选择。典型的音频子系统包括音频编解码器和音频放大器。基于无滤波器调制专利电路的 TPA3007D1 是高效、先进的D类音频放大器。TI的视频监控解决方案主要基于高性能TMS320DM64x数字媒体处理器，这些处理器具有用于实现与视频设备的简易连接的片上视频端口。DM64x 器件能够处理面向基于IP的视频监控应用的视频和音频编码/解码。针对 JPEG、MPEG2、MPEG4、H.264 等标准的、具有成本竞争力的视频压缩/解压缩算法可从 TI 或通过我们的合作方网络获得。此外，还可提供音频压缩/解压缩算法。




*IP视频节电方框图*



## 高性能数字信号处理器
## TMS320DM64x

敬请访问**www.ti.com/sc/device/TMS320DM642**，以获取样片、数据表及相关应用报告。

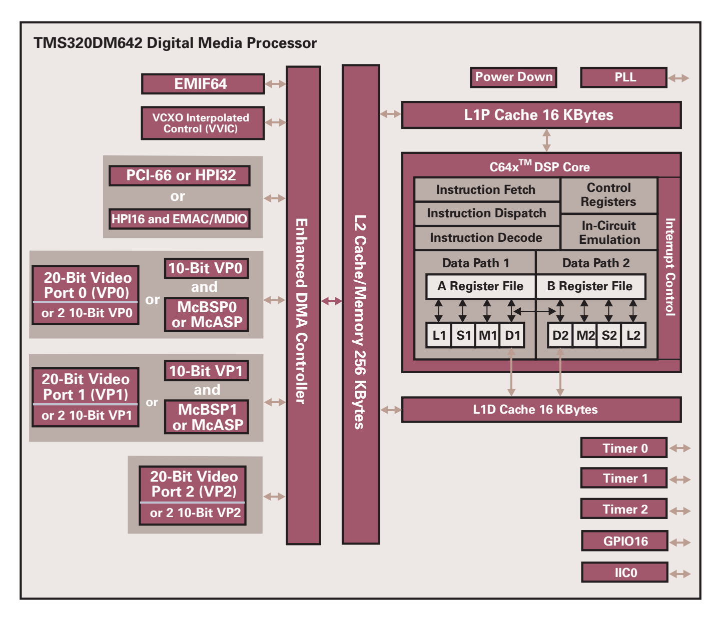
TI 的视频监控解决方案基于高性能 DM64x DSP 核心的数字媒体处理器。DM64x 数字媒体处理器具有用于实现至视频设备的简易型连接的片上视频端口，并能够处理面向基于 IP 的视频监控应用的视频和音频编码/解码。由于免除了增设外部 PCI 或 EMAC 的需要，因此该单通道可编程DSP是经济高效的解决方案。

### 主要特点

- 性能高达5760MIPS（720MHz条件下）
- 多输入/输出无黏结接口以用于常用的视频和音频格式
- 高性能实时视频编码、解码或码转换
- 三个双通道视频端口可支持同时视频输入/输出
- 采用10/100以太网MAC和66MHz PCI的高级连接
- 即用型应用软件，比如：MPEG-4、MPEG-2、MPEG-1、WMV9、H.26L、H.263、H.261、M-JPEG、JPEG2000、JPEG、H.264，等等

### 应用

- 基于网络摄像机的监控及IP视频节点
- 视频点播机顶盒、个人录像机和数字媒体中心
- 统计多路复用器和广播编码器
- 基于IP的视频会议和基于IP的可视电话




*TMS320DM642数字媒体处理器方框图*

## 高性能数字信号处理器
## TMS320C6414T、TMS320C6415T

敬请访问**www.ti.com/sc/device/TMS320C6414T**及**www.ti.com/sc/device/TMS320C6415T**，以获取样片、数据表及相关应用报告。

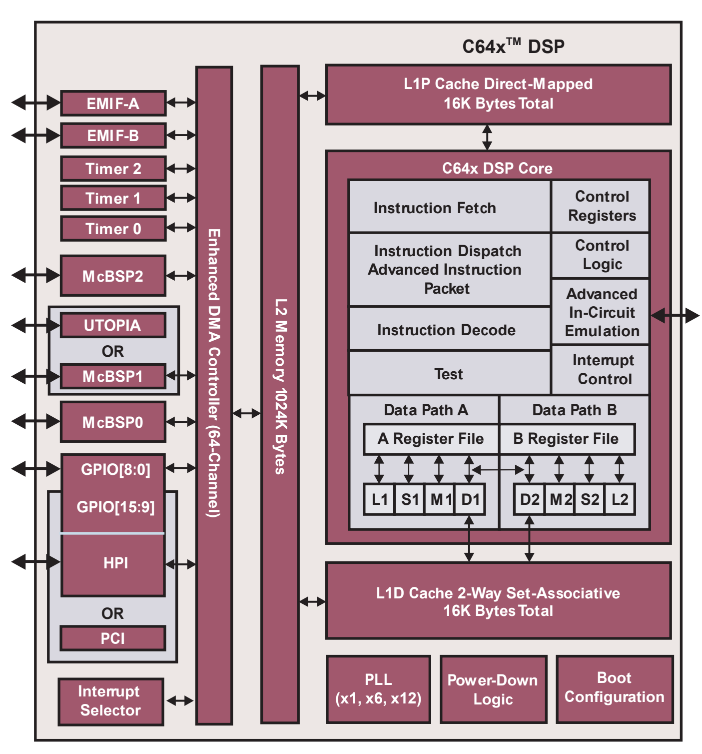
TMS320C64x™ DSP提供了极高的性能水平，旨在满足数字时代的要求。在1GHz的时钟频率条件下，C64x™ DSP能够以8000MIPS以上的速率进行信息处理。TI的C64x DSP得到了大量精选的优化算法以及业界领先的开发工具的支持。

### 主要特点

- 具有同类器件中最高的性能，生产型器件的时钟频率已高达1GHz
- TMS320C64x DSP的代码与TMS320C6000™ DSP完全兼容
- C64x DSP可提供高达8000MIPS的处理性能，而成本仅为20.00美元
- 先进的C编译器和汇编优化程序最大限度地提升了效率和性能
- 封装型式：23/27mm BGA封装选项

### 应用

- 统计多路复用器
- 广播编码器
- 视频会议
- 视频监控




*TMS320C6415T DSP方框图*



## 监控摄像机、玻璃裂损、烟雾检测

### 器件推荐

| Device | Description | Key Features | Benefits |
|---|---|---|---|
| **Amplifiers** | | | |
| TLV246x | Op Amp | Ideal for Audio Amplification, Low Power Consumption | Cost-Effective Solution with Low Noise and Small SOT-23 Package |
| TPA3007D1 | Class-D Audio Power Amp | 6.5W into an 8Ω Load from 12V Supply, $3^{rd}$ Generation Modulation Technique, Short Circuit Protected | Replaces Large LC Filter with Small Ferrite Bead Filter, No Heatsink Required, Improved Efficiency, Improved SNR |
| **Data Converters** | | | |
| TVP5146 | NTSC/PAL/SECAM 4 x10-Bit Digital Video Decoder w/Macrovision | Quad, 30MSPS, 10-Bit ADC, Supports Component YPrPb/RGB, Programmable Video Output Format, Certified Macrovision Copy Protection Detection, Built-In Video Processing, VBI Data Processor, $I^2C$ Interface | 10 Video Inputs, SCART Support, Includes a 5-line Adaptive Comb Filter for Best-in-Class Y/C Separation, 4 10-Bit, 30MSPS ADCs for Superior Noise Performance |
| TVP5150A | 8-Bit Video Decoder (PAL, NTSC, SECAM) | Single 8-Bit ADC, Composite and S-Video Support, Built-In Video Processing, $I^2C$ Interface | 2 Video Inputs, 4-line Adaptive Comb Filter, Fast Lock Times, Extremely Low Power, Low Cost |
| TLV320AIC12 | Dual-Channel Voice Codec | Programmable Sampling Rate Up to: Max 26kSPS w/On-Chip IIR/FIR Filter, Max 104kSPS w/IIR/FIR Bypassed, Built-In Amps for Microphones/Speakers | Directly Connect to McBSP without Logic, Interface with Multiple Analog I/Os DSP Software, Analog/Digital PGA to Increase Performance |
| **Processor** | | | |
| TMS320DM642 | Video Processor | Ability to Perform Video/Audio Encode on Multiple Channels, Direct I/F to NTSC/PAL Decoder Through Video Ports/Audio Through McBSP | Cost Effective with Single Programmable DSP, No Need for External PCI or EMAC, Eliminates the Need for External FPGA |
| **Power Management Products** | | | |
| TPS2383 | Power Sourcing Equipment Power Managers (PSEPM) | Internal PD Detection Signature Output, Internal PD Classification Output, Programmable Inrush Current Limit, 0.3Ω Low-Side FET Input, Internal Thermal Protection and UVLO Compliant to the PoE IEEE 802.3af Standard | Individually Manage Power for Up to 8 Ethernet Ports, All Operations of the TPS2383A are Controlled Through Register Read and Write Operations Over a Standard (Slave) $I^2C$ Serial Interface |
| UCC1809/ 2809/3809 | Current Mode PWM Controller | Programmable Soft Start with Active Low Shutdown | Anti-Cross Conduction Circuitry, Allows the Output to Sink Current by Allowing the Synchronous Rectifier to Turn on w/o the Switch Node Collapsing |
| TPS2370 | Power Interface Switch | All Detection, Classification, Inrush Current Limiting and Switch FET Control Necessary for Compliance with IEEE 802.3af Standard | Low-Input Voltages (1.8V to 10V), Draws >12μA, Allowing Accurate Sensing of the External 24.9-kΩ Discovery Resistor |
| TPS76850 | Fast-Transient-Response 1A LDO | Low Drop-Out = 230mV at 1A, 2% Tolerance, Open Drain Power Good, Thermal Shutdown Protection | Designed to Have a Fast Transient Response and be Stable with 10μF Low ESR Cap at Low Cost |
| TPS70148 | Dual-Output LDO for DSP Systems | 1.2V/1.5V/1.8V/2.5V/3.3V Options for Dual-Output Voltages, Selectable Power-Up Sequence for DSP Applications, Power-On Reset with Delay, Power Good, Two Manual Reset, Thermal Shutdown | Complete Power Management Solution Designed for $TMS320^{TM}$ DSP Family, Easy Programmability, Differentiated Features: Accuracy, Fast, Transient Response, SVS Supervisory, Reset and Enable Pins |
| TPS5130 | Triple Sync Buck Controller with LDO | 3 Independent Step-Down DC/DCs and 1 LDO, 1.1V-28V Input Range, 0.9V to 5.5V Output Range, Sync for High Efficiency, Auto PWM/SKIP Overvoltage/Current Protection, Short-Circuit Protection | On-Chip Sync Rectifier Drives Less Expensive N-Ch MOSFET, Allows Smaller Input Cap to Reduce Cost, Resistor-Less Current Protection Reduces External Part Count |

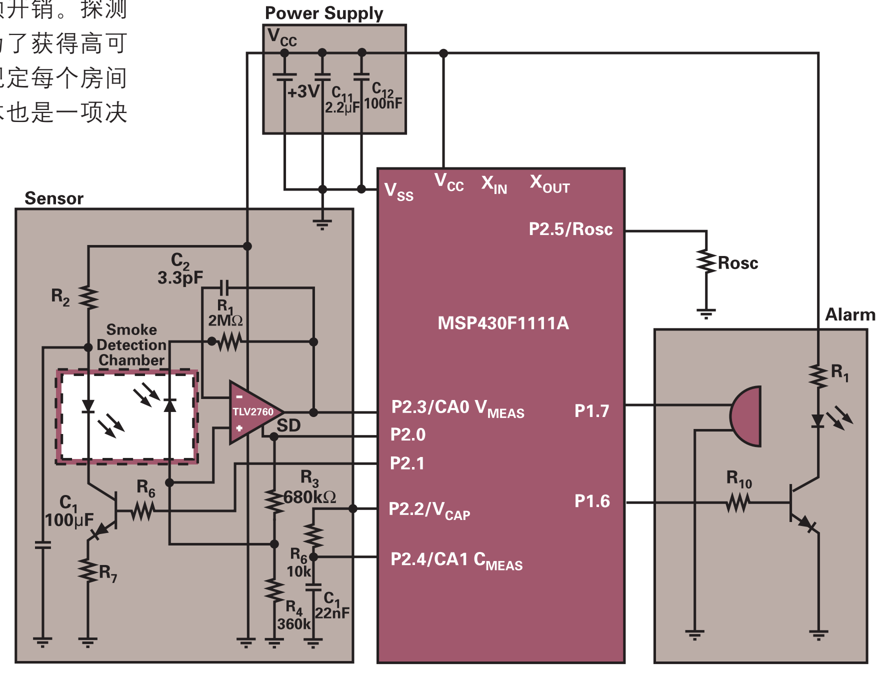


## 烟雾检测

烟雾探测是一项重要性很高的应用，不仅是因为人的生命有赖于传感器的可靠性，而且还因为误报警将导致巨额开销。探测烟雾的方法有很多种，不过最常用的还是光探测。为了获得高可靠性，需要采用高集成度解决方案。由于相关法律规定每个房间都必须安装探测器（比如在宾馆饭店中），因此成本也是一项决定性因素。

为了实现低维护成本，电池必须具有长达数年的使用寿命，这就要求采取“脉冲式”应用方式，并具有快速唤醒时间、快速处理时间和超低待机电流。这使得MSP430微控制器成为此类应用的理想选择。

右图示出了烟雾探测器的核心部分。脉冲式IR发送器和IR接收器被布设在采取了隔外光措施的反射型测量室中，只有被烟雾所反射的来自IR发送器的光能够到达IR接收器。实施了两项连续的测量。第一项是测量IR发送器关断时周围的光；第二项是测量IR发送器接通时的反射光。这种差分测量法不仅需要采用高动态范围线性传感器和电路，而且还要求系统具有高线性度。




烟雾检测方框图

## 器件推荐

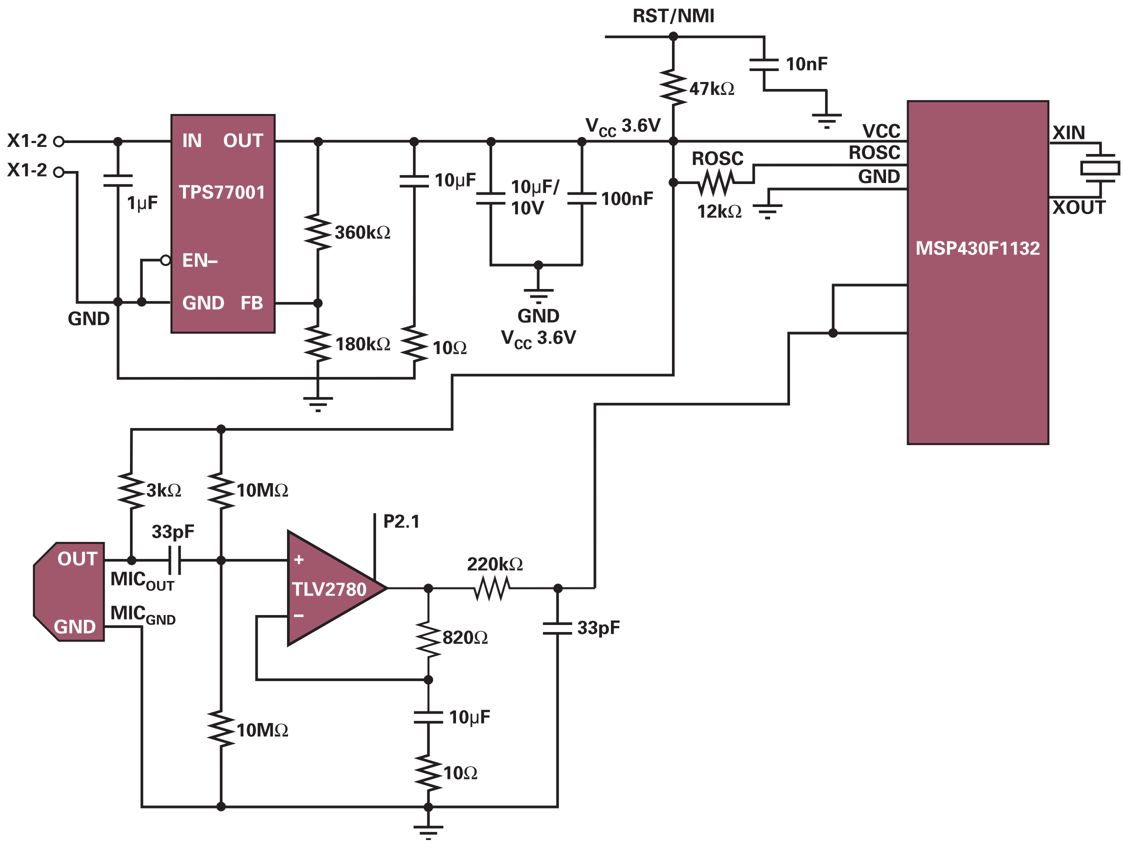
| Device Type | Recommended Device | Device Characteristics |
|---|---|---|
| Microcontroller | MSP430F1111A | 1.8V to 3.6V Lowest-Power μcontroller with Analog Comparator for Dual Slope A/D Conversion |
| Operational Amplifiers | OPAx340 | Fast RRIO Transimpedance Amplifier with Trimmed Offset Voltage |
| | OPAx336 | Low-Offset, Low-Drift, RRO Amplifier with Only 32μA Quiescent Current |
| | OPAx381 | Fast, Zero-Drift Transimpedance Amplifier with <1mA Quiescent Current |
| | TLV247x | Fast, Lowest-Drift 0.4μV/°C, General-Purpose Amplifier with Shutdown |
| | TLV276x | Medium Speed, 1.8V RRIO Amplifier with Shutdown and Fast Turn On/Off Time |
| | TLV224x | 1μA, 5kHz, RRIO Nanopower Operational Amplifier |
| | **OPAx379** | 1.8V, 2μA, 100kHz, RRIO Nanopower Operational Amplifier |

新器件用**红色粗体**标注。

## 监控摄像机、玻璃裂损、烟雾检测

### 玻璃裂损探测器

典型的声学玻璃裂损传感器的工作原理是采用麦克风来测量玻璃中压力差的声音频谱。第一个信号波代表由击中玻璃的物体所引发的振动。该频率约为 200kHz。第二个频率约为 5kHz 的信号出现于玻璃破裂时。下图示出了采用低压差稳压器、放大器和具有板载 ADC 的 MSP430 微控制器所构成的实现方案。需要采用快速轨至轨放大器来把传感器信号电平提升至 ADC 输入电压范围。随后的各级电路均被集成在 MSP430 信号控制器中。




*玻璃裂损探测器方框图*

### 器件推荐

| Device Type | Recommended Device | Device Characteristics |
|---|---|---|
| Microcontroller | MSP430F1132 | 1.8V to 3.6V $V_{CC}$, industry's lowest-power µcontroller with integrated 10-bit, 200kSPS ADC |
| Operational Amplifiers | TLV278x | Fast 8MHz GBW, 4.3V/µs SR, 1.8V, RRIO operational amplifier with shutdown |
| | OPAx363 | Fast 7MHz GBW, 6V/µs SR, 1.8V, RRIO amplifier with excellent input linearity and shutdown |
| | OPA336 | 2.3V to 5.5V single supply, RRO within 3mV, 20µA/amp $I_Q$, 125µV (max) offset, 1pA bias current |
| | OPA348 | 1MHz BW, 2.1V to 5.5V single supply, RRIO, 45µA (typ) $I_Q$, 0.5pA bias current |
| | OPA381 | 18MHz GBW, extremely high precision, excellent long-term stability, low 1/f noise, 5 decades dynamic range, 800µA $I_Q$ |
| Voltage Regulator | TPS77001 | Adjustable, 50mA output current voltage regulator with low dropout and low quiescent current |
| Data Converter | ADS7866 | Lower power family at 8-, 10-, 12-bit >200kSPS, 1.2V to 3.6V ADC |



自从有账单以来，机电式仪表一直都作为测量电的标准。当前，电气企业正需要更多来自住宅端仪表（典型计量单位限制于千瓦时）的信息。新的特点，诸如多费率单、无功能量测量，以及电源质量监测都已成为下一代产品的需求，并用于配送、客户服务及费率单生成。为了满足机电式仪表所不能实现的高层次需求，厂商们开始采用全电子的解决方案。源自TI的新型能量测量集成电路能满足公共事业企业所要求的主要需求，并确保了精确度、可靠性及仪表的鲁棒性。TI 提供了首款单片IC 以及所需的相关模拟产品，用于满足电测量的需要，从而在完善了高效能量计的设计的同时为厂商节约了宝贵的设计时间及开发费用。

## 电子能量计

### 业界首款用于电子能量计的单芯片IC

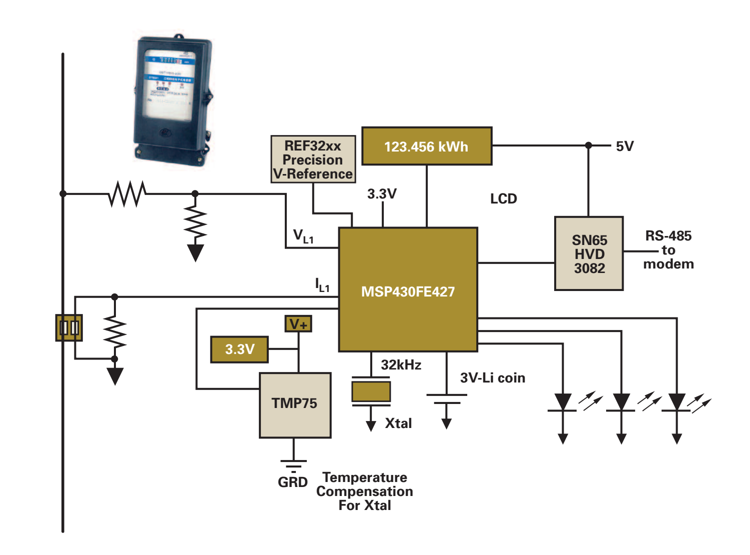
- 面向电子能量计应用的单芯片解决方案
- 单电源解决方案
- 集成于ESP430CE1模块中的协处理器的模拟前端(AFE)
- 旨在实现极长使用寿命的超低功耗MSP430FE42x
- 主CPU的运行主要用于诸如纹波控制、资费切换或睡眠等通信功能
- 可提供诸如 Rogowski 线圈的分流、电流转换器 (CT) 和 di/dt 传感器

**计算结果：**

- 有功功率、无功功率、表征功率
- 软件可编程测定启动电流
- 状态
- 波形采样
- 功率因数
- 直流消除
- 电源周期
- RMS值、峰值(电流/电压)
- 温度
- 线路周期计数器
- 自动压降检测 — 利用软件来选择电平
- 用于单相、双线式测定的篡改检测

### 下一代电子能量计

MSP430FE42x是专为满足下一代电子能量计的要求(包括满足诸如欧洲的IEC62053-21/22/23标准以及美国的ANSI C12.XX标准的能力)而设计的。高集成度实现了具有极小外形尺寸和极低成本的易用型解决方案。




## 期间推荐

| Device | Description | Key Features | Benefits | Other TI Solutions |
|---|---|---|---|---|
| **Microcontroller** | | | | |
| MSP430F427 | Ultra-Low-Power, 16-Bit RISC CPU | Single-Chip IC for Electronic E-meter | Easily Integrated Solution in a Small Package and Lowest Cost | MSP430FE423/FE25 |
| **Interface** | | | | |
| SN65HVD3082E | 5V, Half-Duplex RS-485 Transceiver | Ideal for Metering Applications, Low Power Consumption and Slew Rate Control | Cost-Effective Solution with Low-Power and Slew Rate Control | SN65HVD3085E |
| SN65LBC184 | 5V, Half-Duplex RS-485 Transceiver | Ideal for Metering Applications, Integrated Transient Voltage Protection and Slew Rate Control | Integrated Transient Voltage Protection for Highest Reliability | SN65LBC182 |
| **Data Converter** | | | | |
| ADS8364 | 6Ch, 16-Bit, 250kHz SAR | High-Speed Simultaneous Sampling ADC for | Fastest Control Loop to Secure Circuit Breaker Shut Off | ADS1204 |
| **Voltage Reference** | | | | |
| REF32xx | 4ppm/°C, 100μA, SOT23-6, Series Voltage Reference | Very Low Drift, High Output Current ±10mA, High Accuracy 0.01%, Low Quiescent Current 100μA | Small Package, Excellent Performance, Competitive Price | REF31xx, REF30xx, REF29xx, REF02, |
| **Amplifier** | | | | |
| OPA363 | Rail-to-Rail, 1.8V, High CMRR, GBW 7MHz | Low Noise , No Crossover Distortion at Low Power | Ideal for Driving High-Speed and Precision 16-Bit ADCs | OPA2822, OPA350 |
| **Digital Temperature Sensor** | | | | |
| TMP75 | Digital Temp Sensor with Two-Wire Interface | 9 to 12-Bit User Selectable, ±1.5˚C (max) from –25˚C to +85˚C, Low Quiescent Current 50μA | Low Power, Small Package, High Resolution, Good Accuracy | TMP175, TMP100 |

## 科研仪表

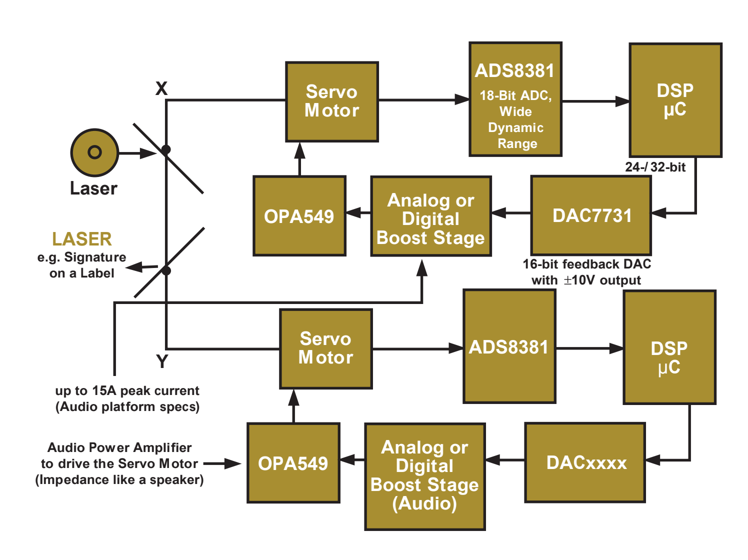
### 科研仪表

在当今的工业科学仪表应用（比如气相/液相色谱分析、质谱测量和振动分析），往往要求在实现最佳信噪比、最低纹波和总谐波失真 (THD) 的同时以最高的分辨率和速度来对模拟信号进行处理。对于自动测试设备 (ATE)，还希望其具有极低的积分非线性误差 (INL) 和微分非线性误差 (DNL)。

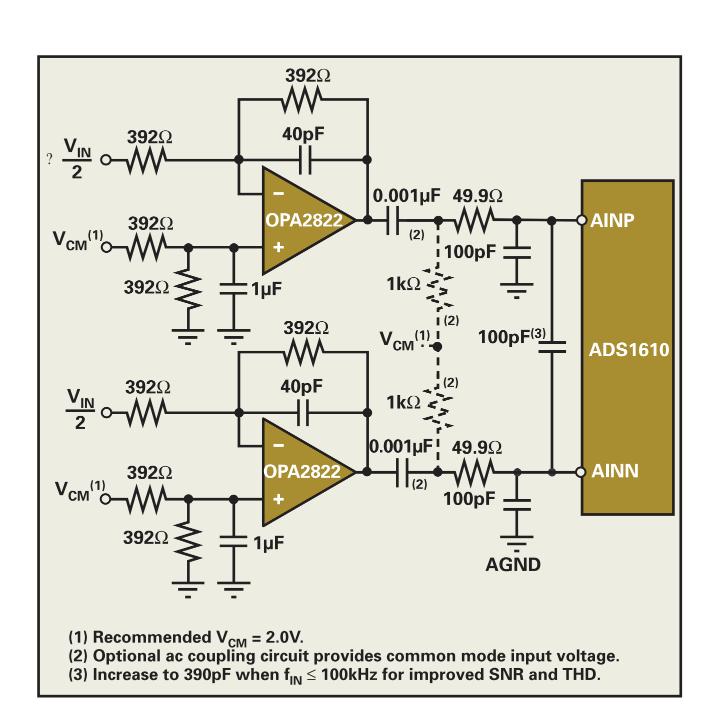
在气相色谱分析应用中，ADC负责对信号进行转换，并将所需的频率分量从混合信号中分离出来。如何在实现高信噪比的同时将高分辨率（16位至18位）与极高的速度（MHz级）结合起来是设计者面临的主要难题。

ADS160x 系列16位、5MSPS、ΔΣ型 ADC 是专为那些基于新获专利权的自适应随机化数据加权平均 (DWA) 算法架构的应用而开发的，工作带宽高达 10MHz（在2倍模式中为 10MHz），并实现了高于 100dB 的无杂散动态范围 (SFDR)。

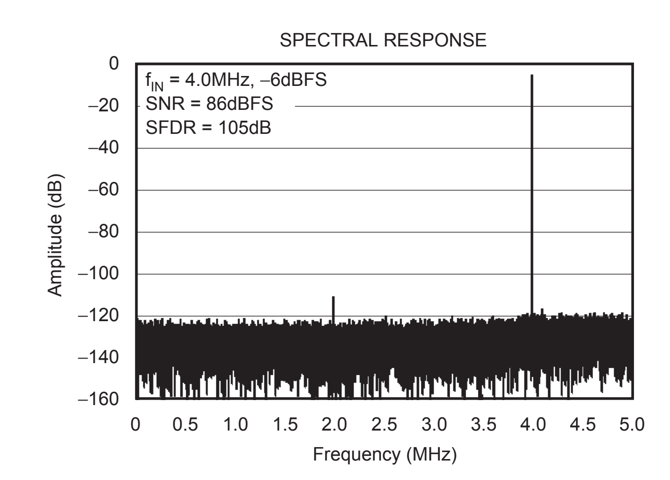
在诸如用于精密激光束控制的反射镜定位应用中，需要采用快速、高分辨率控制环路，以实现最高的准确度和吞吐量。ADC需在最高分辨率条件下拥有最低的延迟，以便完成激光的定位。下图示出的应用中采用了ADS8381(18位、500kHz)，这是目前速度最快的SAR型ADC之一，并具有112dB的SFDR和18位的NMC(无漏失码)。




DWF1-364838激光镜定位应用、测试及工作原理：每镜用于一个方向的检测




采用OPA2822.的高速ADC驱动电路推荐方案

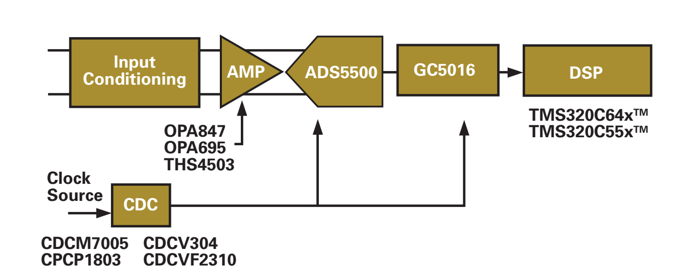



ADS1610光谱响应



## 高速信号分析

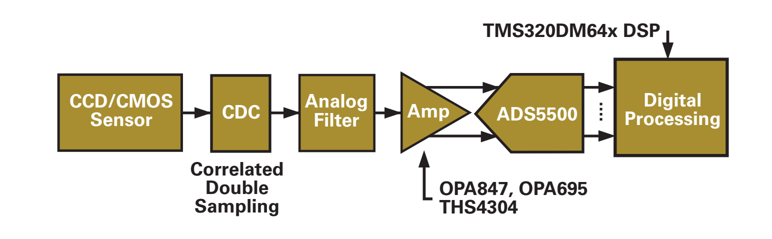
高速测试和测量应用的特点在于需要具有高SNR、高采样速率以及其他取决于系统设计师的要求的高速特性。输入信号可能是大带宽的，因此ADC的输入带宽变得至关重要。同时，为了支持频率高于ADC采样速率的1/2的输入信号，常常采用欠采样，因而要求转换器能够在这些高输入频率上正确运行(实现上佳的SNR/SFDR指标)。外设对信号通路的性能同样具有非常大的影响。用于驱动ADC的放大器将直接影响SNR/SFDR，因此必须谨慎选择以保持规定的系统性能。此外，时钟抖动也会对ADC的性能产生关键性的影响；所以，采用诸如CDC7005等低抖动时钟脉冲源能够提供理想的解决方案。




*ADS5500在测试及测量中的应用*

### ADC在视频和成像中的应用

ADS5500的14位分辨率提供了较高的SNR，旨在实现对高质量图像的准确处理，并通过免除增设可编程增益放大器之需的方法来简化模拟输入电路。另外，其高采样速率还使得设计人员能够以更快的速度来扫描图像，或对输入信号进行过采样，从而简化了模拟滤波器设计并降低了系统成本。ADS5500的低功耗延长了便携式系统中的电池使用寿命，并由于电源和系统热管理要求降低而节省了成本。




*ADS5500在视频及成像中的应用*

## 高性能ADC

| Device | Resolution (Bits) | Speed (MSPS) | SNR (dBc) | SFDR (dB) |
|---|---|---|---|---|
| ADS5444 | 13 | 250 | 68 at 230MHz IF | 75 at 230MHz IF |
| ADS5440 | 13 | 210 | 68 at 230MHz IF | 79 at 230MHz IF |
| ADS5500 | 14 | 125 | 69.5 at 100MHz IF | 82 at 100MHz IF |
| ADS5424 | 14 | 105 | 74 at 50MHz IF | 93 at 50MHZ IF |
| ADS5541 | 14 | 105 | 71 at 100MHz IF | 86 at 100MHz IF |
| ADS5423 | 14 | 80 | 74 at 50MHz IF | 94 at 50MHz IF |
| ADS5520 | 12 | 125 | 68.7 at 100MHz IF | 82 at 100MHz IF |
| ADS5521 | 12 | 105 | 69 at 100MHz IF | 86 at 100MHz IF |

## 补充产品

| TI Solution | Device | Device Characteristics |
|---|---|---|
| High-Speed Amplifier | OPA695 | Ultra-Wideband (1.4GHz), Current-Feedback, 2500V/µs Slew Rate (G=+2) |
| High-Speed Amplifier | THS9000/THS9001 | 50 to 350MHz Cascadeable Op Amp Optimized for High IF Frequencies |
| Digital-to-Analog Converter | DAC5686/DAC5687 | Dual-Channel, 16-Bit, 500MSPS with Selectable 2x to 16x Interpolation Comms DAC |
| Digital Up/Down Converter | GC5016 | Wideband, Quad, Channels Independently Configurable, Low Power |
| Clock Distribution Circuit | CDCM7005/CDC7005 | Low-Phase Noise, Low-Skew Clock Synthesizer and Jitter Cleaner, 3.3V Supply |
| Digital Signal Processors | TMS320C64x™, TMS320C55x™ | 16-Bit, Fixed-Point DSPs, Up to 1GHz Clock Rates and 8-Giga MACs of Performance, With the Industry's Best Power-Consumption Benchmarks |
| Digital Signal Processor | TMS320C67x™ | 32-Bit DSPs With Up to 1G FLOPS of Floating-Point Processing Performance |
| High-Speed Amplifier | THS4509 | Ultra-Low Noise, Wideband Amplifier |

## 射频应用

车间通信的实现存在诸多障碍(比如电缆和布线成本昂贵等)，为了获得针对这些不利条件的高效无线解决方案，工业应用不得不等待了许多年。迄今为止，在以简化工业接口为目的的各种努力中，取得成功的极少，尤其是近期随着像计量、安全系统、火情探测器和HVAC系统这样的应用中对降低功耗和系统成本要求的日益提高，这种情况变得愈发突出。

为满足此类市场需求，TI推出了多频带射频 (RF) 收发机 TRF6903 及发射机 TRF4903。此器件能无线传输和/或接受高达 64kbps 的数据率，以用于315、433、868、以及915MHz的工业、科研及医学 (ISM) 频带应用。3这些器件还能方便的连接到诸如 TI 的 MSP430 等基带处理器。TRF6903 及 TRF4903 拥有同步数据时钟，其可编程特性能提供大多数常用数据率，简化基带处理器并降低代码复杂性。这些器件能够与各种 MSP430 微处理器系列成员很好地配合使用，并可提供完整的EVM套件和软件。

TRF6903和TRF4903同时也是单芯片解决方案，可用于建立频率可编程、半双工、双向RF链路的低成本多频段移频键控(FSK)或开关式键控(OOK)设备。这些器件可在低至2.2V的电压条件下工作，并专为实现低功耗(待机电流为0.6 μA)而设计。

对于跳频系统来说，这些器件可说是可选的最高速及高效的跳频器。TRF6903 及 TRF4903 在跳变到一个新的频点时不需要进行校准，从而使它们在高数据率时也能高效工作。

### 特点

- 可选收发器(TRF6903)和发送器(TRF4903)
- 315、433、868和915MHz工作频率
- 自适应频率跳变协议
- 具有训练识别能力的时钟恢复
- 待机电流：0.6 μA(典型值)
- 2.2V至3.6V工作电压
- 输出功率：+8dBm(典型值)
- 支持FSK/OOK调制方式运转
- 数据速率高达64kbps
- 工业温度范围：-40°C至+85°C

### 可选工具：

- 免费样片
- 评估模块的单价为149美元
  - MSP-TRF6903-DEMO：两块装有TRF6903和MSP430F449的电路板
  - MSP-TRF4903-DEMO：两块装有TRF4903和MSP430F449的电路板

TRF6903 和 TRF4903 的 EVM 套件用于演示两块电路板之间的双向 RF 链接，并通过采用 JATG 连接器将新型软件代码下载至 MSP430F449 的方法来完成原型设计。如果需要的话，可将电路图和电路板布局用作参考设计。其中包含了用户指南。

### 系统设计软件

用于TRF6903的EasyRF™工具：计算值用于PLL滤波器、LNA、PA匹配、晶体开关电容器、IF匹配和S/H电容的值。

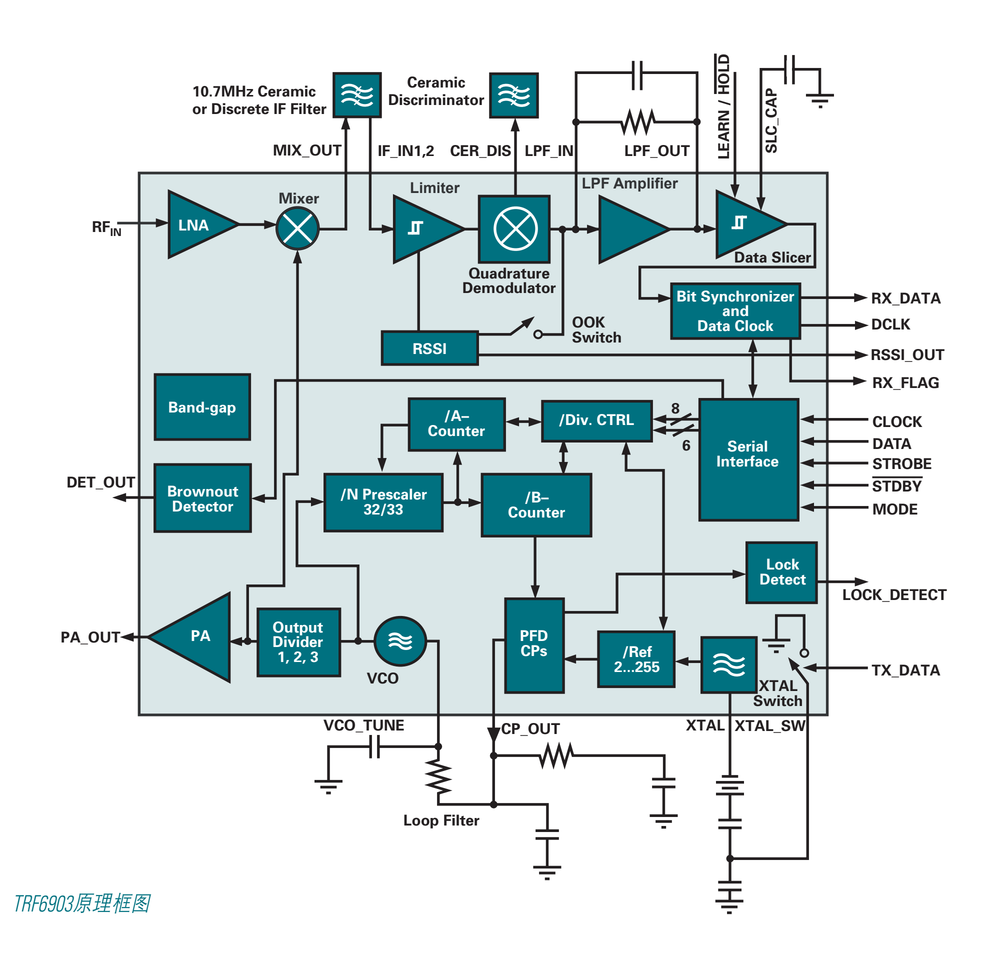
用于TRF4903的EasyRF™：计算用于 PLL 滤波器、PA 匹配和晶体开关电容的值。




*TRF6900无线连接，运转于315、433、868、及 915MHz*

如需下载此类工具或获取更多有关ISM RF的信息，敬请访问 www.ti.com/ismrf






TRF6903原理框图

## 针对工业应用的无线通信器件

| Device | Description | Frequency (MHz) (min) | Frequency (MHz) (max) | Standards Supported | Output Power (dBm) | Operating Voltage (V) (min) | Operating Voltage (V) (max) | Current (μA) | Package | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| TRF6903 | RF Transceiver | 315 | 915 | FSK, OOK | 8 | 2.2 | 3.6 | 0.6 | PQFP-48 | $2.85 |
| TRF6901 | RF Transceiver | 860 | 930 | FSK, OOK | 8 | 1.8 | 3.6 | 0.6 | PQFP-48 | $2.70 |
| TRF6900A | RF Transceiver | 850 | 950 | FSK, Narrow-Band FM | 5 | 2.2 | 3.6 | 0.5 | PQFP-48 | $3.20 |
| TRF5901 | RF Transceiver | 902 | 928 | FSK, Narrow-Band FM | 5 | 3 | 3.6 | 0.5 | PQFP-48 | $3.20 |
| TRF4903 | RF Transmitter | 315 | 915 | FSK, OOK | 8 | 2.2 | 3.6 | 0.6 | TSSOP-24 | $2.00 |
| TRF4900 | RF Transmitter | 850 | 950 | FSK, Narrow-Band FM | 7 | 2.2 | 3.3 | 0.5 | TSSOP-24 | $1.90 |
| TRF4400 | RF Transmitter | 420 | 450 | FSK, Narrow-Band FM | 7 | 2.2 | 3.6 | 0.5 | TSSOP-24 | $1.90 |

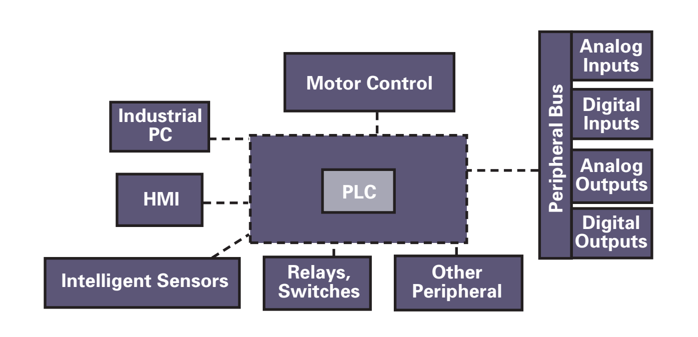
[1]推荐零售价为每1000片时的美元价格。

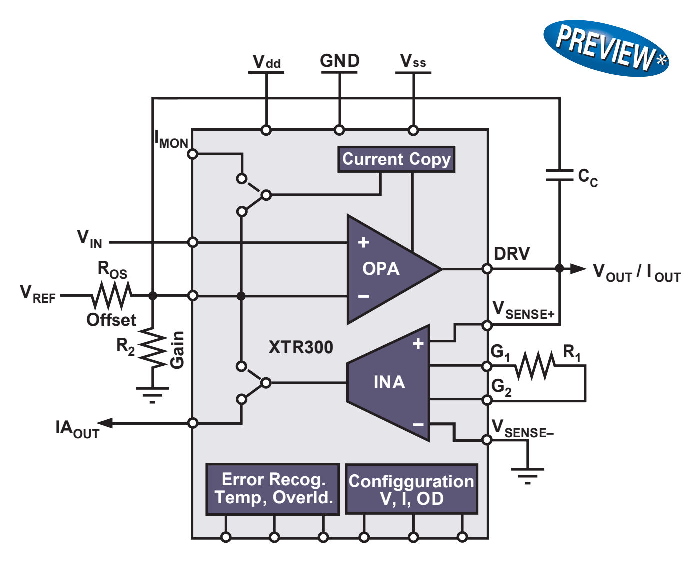
## 输入/输出卡，内部通信/接口/隔离技术、核心逻辑器件

可编程逻辑控制器(PLC)被工业应用所广泛采用(主要是在工厂和工序自动化领域)。PLC系统由不同的子系统组成，这些子系统既可以是完整的集成系统，也可以是基本单元 + 针对不同选项的插卡/模块。

### 工业模拟I/Os

PLC 和空间扩展模块控制着大量的电子调节器，比如电机、螺线管和电子镇流器。由于电子调节器品种繁多且性能要求各异，因此，XTR300 以具有大偏置电压顺应性的驱动电压或电流的形式来提供信号。典型电压范围为 ±5V、±10V，而电流范围包括 ±20mA、±10mA，以及 0-20mA 和 4-20mA。




*XTR300方框图*

除了这些通用的范围，还存在许多专有的信号接口，这些接口都存在同一个问题，那就是要为电子驱动设计量身定做以实现与所需激励起输出的匹配。

为了简化设计难度，TI开发出了这个工业模拟电流/电压输出驱动器，XTR300。此器件提供一个运算放大器以用作前向检测的信号驱动器，并为反馈回路提供了一个仪表放大器。

数字控制可设定XTR300处于电压输出或电流输出模式。错误标志位用于指示过温、过载错误、及共模错误。

对于大多数的应用来说，仅需设定2个电阻值（$R_1$及$R_2$）以及选定电流或电压模式，即可满足提供宽范围输出信号的需要（最高可达±25mA或±17.5V）。

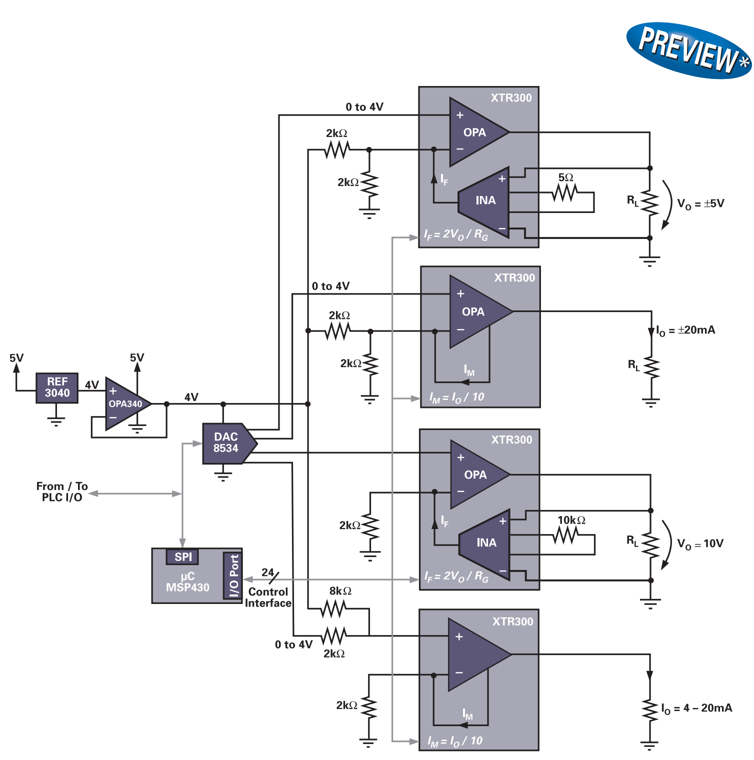
如需更多的特定输出范围，可修整参考电压、$V_{REF}$、以及增益电阻 $R_{OS}$ 值。

于35页上方的图片展示了±10V 或 ±20mA单通道输出 (取决于 XTR300 的数字控制是针对电压模式还是电流模式) 的典型应用。

用于控制的DAC (DAC8531) 和 XTR300 采用给定的基准电压。微控制器负责执行器件配置、误差监视并提供DAC 输入代码。DAC8531 的模拟输出馈送至 XTR300 的输入端，然后用于驱动位于终端连接器之后的负载。

对于不固定负载，开关$S_1$提供了选项，用于设定输入到仪表放大器的信号的参考地。LC 和 RC网络用于RF 和 LF 噪声抑制。

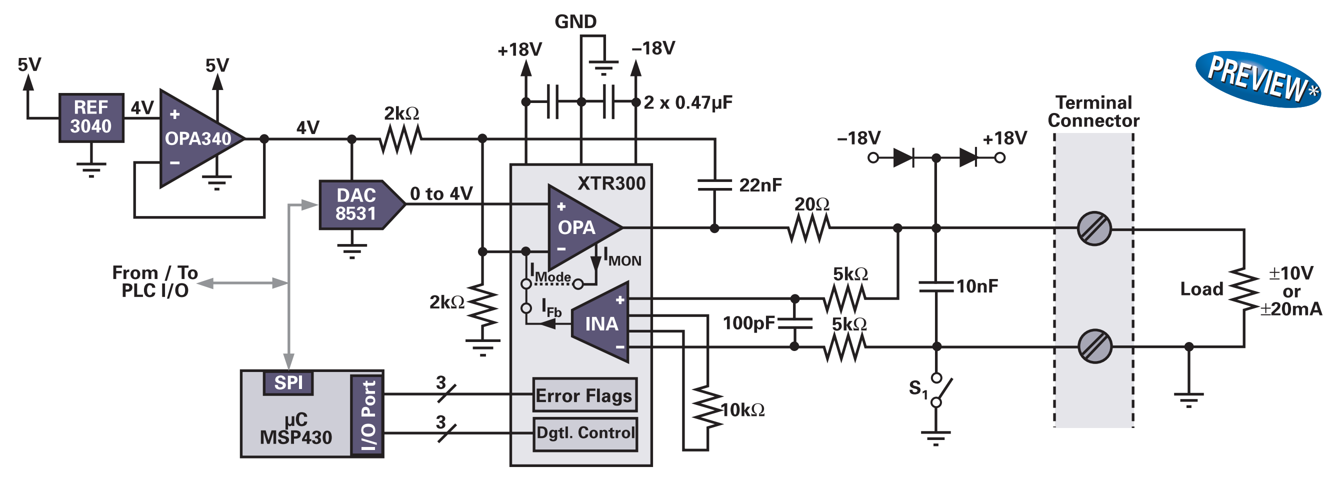
下图所示的多通道驱动器采用四通道DAC(DAC8534)来控制4个具有不同输出范围的XTR300驱动器。




*四通道驱动器及4个XTR300*



## 输入/输出卡，内部通信/接口/隔离设施、核心逻辑器件




采用单个XTR300的单通道驱动器，$V_{IN} = 0 – 4V$, $V_{OUT} = \pm 10V$ or $I_{OUT} = \pm 20mA$.

* XTR300预计发售日期为2006年第二季度

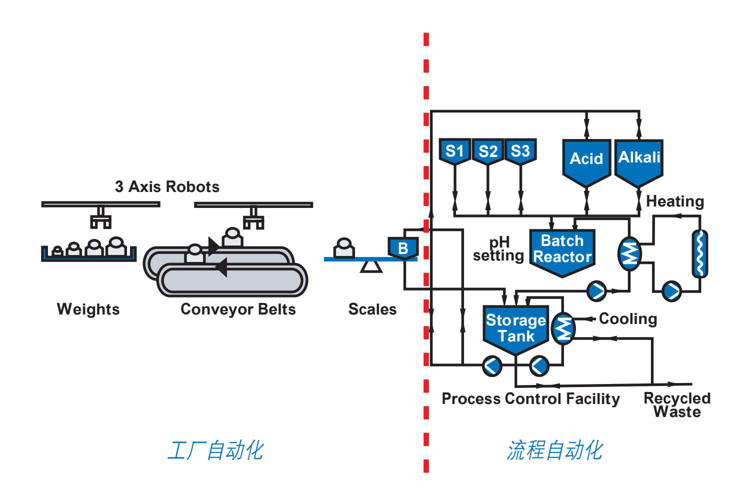
## 器件推荐

| Device | Description | Key Features | Benefits | Other TI Solutions |
|---|---|---|---|---|
| **Power Management Products** | | | | |
| REF3140 | Voltage Reference | Drift = 20ppm/°C, 4.097V, 0.2% | Very Low Drift, Tiny Package | REF02, REF102 |
| DCV010515D | Dual Converter | Isolation Converter, $+5V_{IN}$, $\pm 15V_{OUT}$ | Low Noise, Small Board Area | DCP010515 |
| DCV010505D | Dual Converter | Isolation Converter, $+5V_{IN}$, $\pm 5V_{OUT}$ | Low Noise, Small Board Area | DCP010505 |
| TPS54110 | SWIFT™ Buck Converter | Adjustable Output (0.9V – 3.3V), 1.5A | Very Easy to Use, Flexible Output | TPS64200 |
| **Amplifiers** | | | | |
| INA118 | Instrumentation Amp | Gain = 1 to 1000, CMRR > 110dB, 8-Pin | Very Low Power | INA128 |
| ISO124 | Isolation Amp | Isolation = 2400V, Output = ±10V | No External Components Required | ISO122 |
| PGA204 | Prog. Gain INA | Gain of 1, 10, 100, 1000, Precision | Small Package | PGA203 |
| OPA227 | Low Noise Amp | $V_N$ = 3nV, CMRR > 120dB, $V_S$ = 5–36V | Very Low Noise, Small Package | OPA350, OPA725 |
| DRV591 | PWM Driver | ±3A Max, High Efficiency, Tiny Package | Single 5V Supply, Tiny Package | DRV104 |
| OPA567 | Linear Power Amp | 2A, RRIO 300mV to Rail, Adj Current Limit | Unity Gain Stable, 2.7V to 5.5V supply, Shutdown, Small Package | OPA647 |
| OPA569 | Linear Power Amp | 2.4A, RRO 200mV to Rail, Thermal Protection | Single 5V, Tiny Package, Complete Solution | OPA549 |
| **XTR300** | I/O Driver | ±10V, ±20mA, Input/Output | Multipurpose I/O Driver for All Industrial I/O Voltage Currents | — |
| **Data Converters** | | | | |
| ADS8325 | 16-Bit, 100kSPS ADC | Power = 2mW, 8-Pin, SFDR = 86dB, Power = 82mW | Single 5V Supply, Power Only 2mW, Single 5V Supply for Bipolar | ADS8320 |
| ADS8509 | 16-Bit, 250kHz, CMOS Bipolar ADC | 250kHz Sampling Rate, ±2.0LSB Max INL, ±1LSB Max DNL, 16-Bit No Missing Code | SPI Compatible Serial Output with Daisy-Chain (TAG) Feature, Uses Internal and External Reference | ADS7809 ADS8508/7808 |
| ADS8406 | 16-Bit, 1.25MSPS | Pseudo-Bipolar, Differential Input, $–V_{REF}$ to $V_{REF}$ 90dB SNR, –95dB THD at 100kHz Input | High-Speed Parallel Interface, Single 5V Analog Supply, Low Power, Zero Latency | ADS8412, ADS8402 |
| ADS1251 | 24-Bit, 20kSPS ADC | Power = 155mW, 8-Pin, SFDR = 100dB, | Excellent Performance, Only 7.5mW, Single 5V Supply | ADS1252 |
| ADS1258 | 16-Channel, 24-Bit ADC | 125kSPS, Auto-scan Rate: 23.7kSPS, 24-Bit NMC | 16 SE or 8 Diff, $2.8\mu V_{RMS}$ at 1.8kSPS, Fixed or Auto Channel Scan | — |
| DAC7731 | 16-Bit, 5µs Settling Time | Output = ±10V, INL = 0.0015% | Small Package | DAC7741 |
| DAC7631 | 16-Bit, 10µs Settling time | Power < 2mW, Output = ±2.5V | Single 5V, Small Package | DAC7641 |
| DAC8534 | Quad, 16-Bit DAC | Low Power, 16-Bit Swing DAC | Excellent Price/Performance Ratio, Double Buffered Input Architecture | DAC8532 |
| DAC8554 | 16-Bit, Quad Channel | Power Supply +2.7V to +5.5V | Power-On Reset to Zero-Scale, Schmitt-Triggered Inputs | — |
| DAC8811 | 16-Bit, Multiplying | ±0.5LSB DNL, ±1LSB INL, Serial Input | 4-Quadrant Multiplying Reference, ±10V $V_{REF}$, 3-Wire Interface | — |
| **Interface** | | | | |
| PCI2050B | PCI-PCI Bridge | 66MHz, 32-Bit | — | PCI2250 |
| SN65HVD24 | RS-485 | Failsafe, Extended Common Mode, RX EQ | Only RX with EQ in Industry | SN65HVD23 |
| SN65MLVD200A | M-LVDS Transceiver | 100Mbps, 8-Pin Package | First M-LVDS Complete Transceiver | SN65MLVD202A |
| SN65HVD485E | Half-Duplex Transceiver | 5V Supply, MSOP-8, 10Mbps | Thermal Shutdown Protection, Low Supply Current | — |
| TLK2201 | Gigabit Ethernet TRX | 10-Bit Interface, 1 – 1.6Gbps Serial | Power < 200mW | TLK1501, TLK1201 |
| **Other** | | | | |
| UAF42 | Active Filter | Low-, High- or Band-Pass Filter | Fully Integrated Active Filter | RC Filter |
| MPC50x | Analog Mux | Analog Input = ±15V | — | — |
| FilterPro™ | Free Design Software | Design Low Pass Filters, Quick, Easy | Free, www.ti.com/filterpro | — |

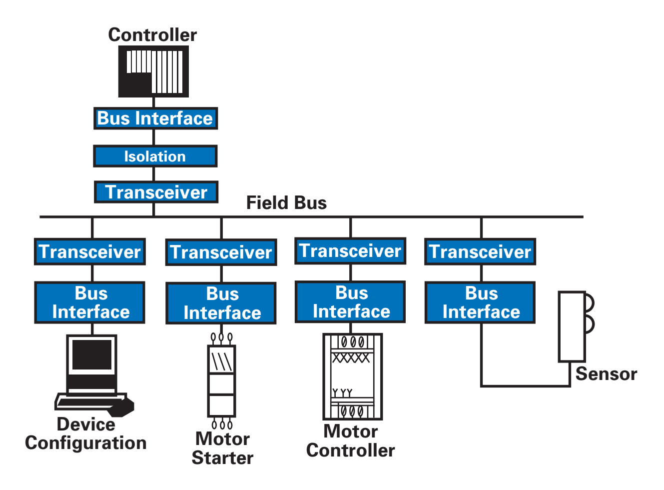
前瞻性器件以**粗体蓝色**标明。

## 厂区通信

由于工人不可能像机器一样快速、精准及高频的操作，工业自动化便成为了制造及其流程步骤计算机化的过程。传统的工业自动化也从而被划分成两个大类：工厂自动化及流程自动化。




工厂自动化　　流程自动化




流程自动化系统

***工厂自动化**是对诸如压力、温度、流量、受迫振动、质量和密度等物理量进行传感及控制。这类应用通常要求10-12位的分辨率以及50-400kbps的通信速率。不过，有多种技术能够以高得多的信号率进行通信，比如速度达到12Mbps的PROFIBUS DP。*

***流程自动化**除了像工厂自动化所进行的一样对物理量进行测定外，还用于成分测定 (比如传导性、PH值和化学分析等)。此类应用通常要求16位的分辨率和 10-50kbps 的通信速率。*

工业自动化环境中的节点分为三个迥然不同的系列：即控制器、传感器和激励器。顾名思义，控制器用于根据预定值以及由传感器提供的信息来管理诸如温度等变量。如果预定值与检测值之间的差异超过某个限值，则控制器将试图通过致动器(如冷却器)来操纵该变量。节点的数目以及这些节点的间距可能相去甚远，从而产生了被称为工业网络的专业通信的需求。

1940年，生产过程用检测仪表通常采用 3-15psi 压力信号对控制器件进行监测。到60年代，引入了最早的标准化通信方法——4-20mA 纯模拟电流环路通信技术。因技术本身的需要，每个节点都需要电缆线将其本身与控制器相连，常常导致布线混乱。到70年代，工业应用开始使用可编程逻辑控制器 (PLCs) 及数字计算机。到80年代中期，工业界所需求的标准化全数字场总线才得以实现。但是，主要的工业企业及国家（主要是德国、法国及美国等）却没有完全放弃其已存在的实际标准，而使得多类标准的竞争开始出现，诸如 PROFIBUS、InterBus、DeviceNet等。这些场总线是完全数字化、串行、双向的通信系统，可为工厂/车间设备监测及器件控制提供局域网服务 (LAN)

### 工业环境中的要求：

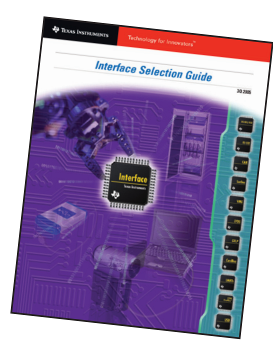
会对各种电气设备造成威胁的危害有许多，因而很难有针对性地对接口电缆采取嵌封或保护措施。设备和网络却要求即使是在最差的环境条件下，也必须能够维持正常的运作。常见危害包括：

- 功率冲击（比如：附近的电机）
- 接地电位差(比如：因对电流进行均衡补偿所致)
- 静电放电(ESD)
- 节点数量过多(比如：在流量控制中采用了多个传感器和激励器)
- 在大型工厂中，铺设的电缆线长度过长

为了能够在这些环境中保持正常工作，设备需要具备以下特性：

- 抗功率冲击(暂态抑制)
- 宽共模范围
- 高ESD保护
- 低单位负载，允许布设多个节点
- 高输出驱动、高灵敏度、接收机平衡、预加重

如需《接口选择指南》，敬请通过访问 interface.ti.com下载。





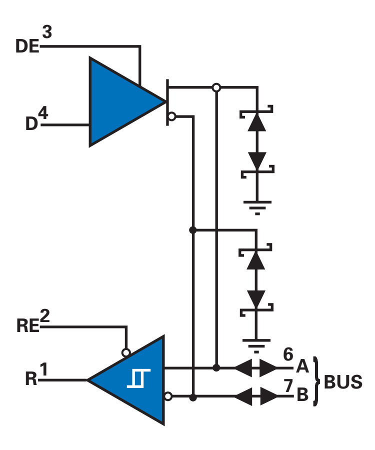
## 具有集成暂态抑制功能的5V、RS-485收发机 SN65LBC184、SN65LBC182

敬请访问**www.ti.com/sc/device/SN65LBC184** 及**www.ti.com/sc/device/SN65LBC182**，以获取样片、数据表及相关应用报告。

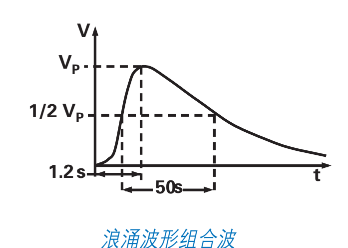
SN65LBC184 差分数据线路收发器具有与 SN75176 相同的业界标准占位面积，并内置高能量噪声瞬变保护功能。该功能显著提高了可靠性，增强了对耦合至大多数现有设备的数据电缆的噪声波动的抗干扰能力。采用这些电路可提供可靠的低成本、直接耦合（无隔离变压器）数据线路接口，而无需使用任何外部元件。SN65LBC184 能够承受典型峰值为 400W 的过压瞬变。引自IEC61000-4-5 标准的传统组合波形用于模拟过压瞬变以及由电感开关和次级侧电击瞬变所引起的单向波动。

### 主要特点 (LBC184)

- 集成瞬变电压抑制
- 标准RS-485共模电压范围：-7V至12V
- JEDEC和IEC ESD保护
  - ±30kV IEC61000-4-2，接触放电
  - ±15kV IEC61000-4-2，空气隔离放电
  - ±15kV EIA/JEDEC，人体模型
- 可在一根总线上布设多达128个节点(1/4单位负载)




逻辑功能示意图（正逻辑）




浪涌波形组合波

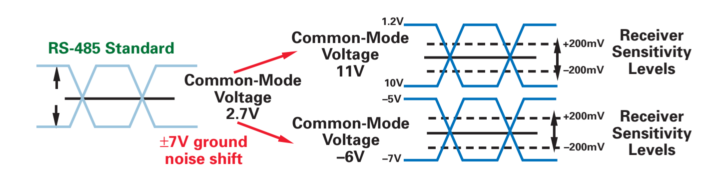
## 具有选择性接收器均衡功能的扩展共模收发器 SN65HVD2x

敬请访问**www.ti.com/sc/device/SN65HVD20**，以获取样片、数据表及相关应用报告。

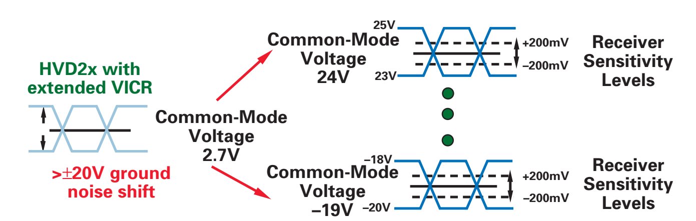
SN65HVD2x器件系列提供了非常宽的输入电压工作范围。RS-485标准要求在接收器输入处于-7V至+12V(±7V加上高达5V的摆幅)之间时，器件能够在DC电平条件下运作。而SN65HVD2x系列的器件几乎可以满足三倍于此的要求，并能够在-20V至+25V的范围内正常工作，且可承受±27V的工作范围以及高达60V的瞬变。

### 主要特点

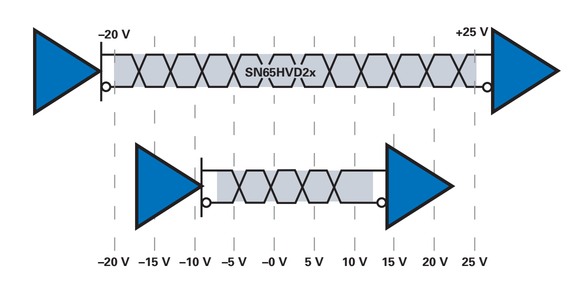
- 共模电压范围(-20V至+25V)达到TIA/EIA-485标准需求的两倍以上
- 业界同类产品中最佳的ESD保护：16kV 人体模式(HBM)
- 一根总线上最多可支持256个节点(HVD21、22和24)(1/8单位负载)
- 可选的接收器均衡功能 (HVD23 和 HVD24)




RS-485标准模式运作




HVD2x的宽共模电压范围




SN65HVD2x 扩展共模电压范围

### 器件推荐

| Numbers | Cable Length and Signaling Rate | Number of Nodes |
|---|---|---|
| SN65HVD20 | Up to 50m at 25Mbps | Up to 64 |
| SN65HVD21 | Up to 150m at 5Mbps (with Slew Rate Limit) | Up to 256 |
| SN65HVD22 | Up to 1200m at 500kbps (with Slew Rate Limit) | Up to 256 |
| SN65HVD23 | Up to 160m at 25Mbps (with Receiver Equalization) | Up to 64 |
| SN65HVD24 | Up to 500m at 3Mbps (with Receiver Equalization) | Up to 256 |



厂区通信

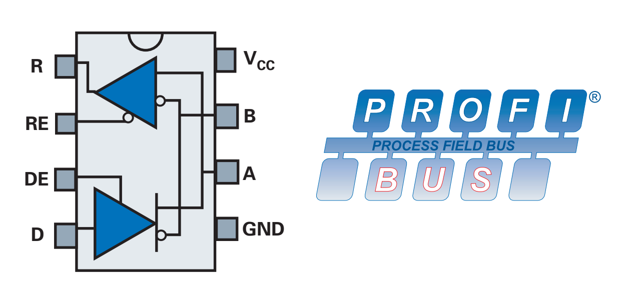
## PROFIBUS收发器
## SN65HVD1176

敬请访问www.ti.com/sc/device/SN65HVD1176，以获取样片、数据表及相关应用报告。

在欧洲，PROFIBUS是最常用的流程自动化总线，并正在其他领域中得到日益广泛的应用。尽管如此，适宜的收发器选择余地仍然极为有限的。事实上，许多年以来，TI的SN65ALS1176是唯一得到PROFIBUS用户组织认可的器件。造成这种现象的原因是很高的输出驱动电压的需求(最小差分输出值为2.1V)，而同时总线电容不得超过10pF。这些要求实际上是相互抵触的，很难实现兼顾。但SN65ALS1176满足了所有的PROFIBUS需求，并提供了对共模噪声的上佳抑制以及显著改善的定时参数。

### 主要特点

- 标准的RS-485共模电压范围：-7V至12V
- 高ESD保护：10kV HBM
- 一根总线上最多可以有160个节点(1/5单位负载)
- 高输出驱动：差分输出超过2.1V




HVD1176原理框图

## 3.3V及5V 高速控制器局域网(CAN)收发机
## SN65HVD23x、SN65HVD251

敬请访问www.ti.com/sc/device/PARTnumber，以获取样片、数据表、评估板及相关应用报告。

(PARTnumber可用SN65HVD230、SN65HVD231、SN65HVD232、SN65HVD233、SN65HVD234、SN65HVD235或SN65HVD251替代)

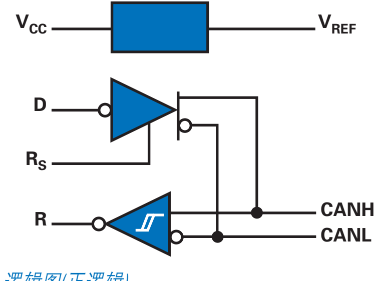
SN65HVD251 (5V) 和 SN65HVD23x (3.3V) 系列 CAN 收发器着眼于苛刻环境下的应用，具有特色的线路跨接、接地无效 (loss-of-ground) 、过压和过热保护功能以及宽共模范围，并能够承受 ±200V 的共模瞬变电压。SN65HVD230/1/2 在总线上工作于 -2V 至 7V 的共模范围，并能够承受 ±25V 的共模瞬变电压；SN65HVD233/4/5 和 SN65HVD251 工作于 -7V 至 12V 的共模范围，并将能分别承受 ±100V 和 ±50V 的瞬变电压。

### 主要特点 (SN65HVD251)

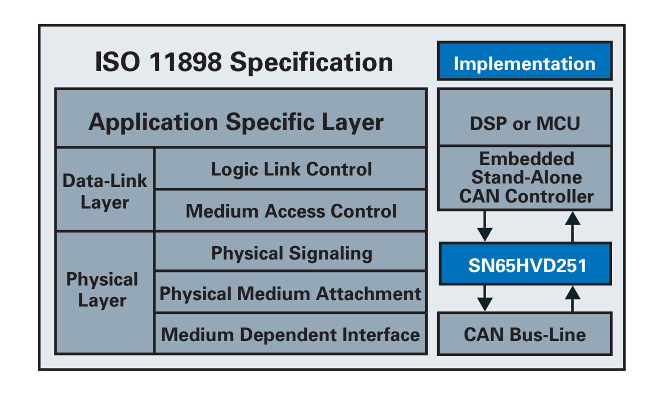
- 是PCA82C250和PCA82C251的临时(Drop-in)改进替代版本
- ±36V的总线故障保护
- 总线引脚ESD保护超过14kV(HBM)
- 高输入阻抗可提供多达120个SN65HVD251节点
- 满足，甚至超过ISO11898标准的要求

### 应用

- CAN数据总线
  - DeviceNetTM数据总线
  - 智能分布式系统(SDS)
- SAE J1939标准数据总线接口
- NMEA2000标准数据总线接口
- ISO11783标准数据总线接口




逻辑图(正逻辑)



## 针对工业和桥接器应用的高性能1394-1995链路层器件 TSB42AC3

敬请访问**www.ti.com/sc/device/TSB42AC3**，以获取样片、数据表、评估板和应用报告。

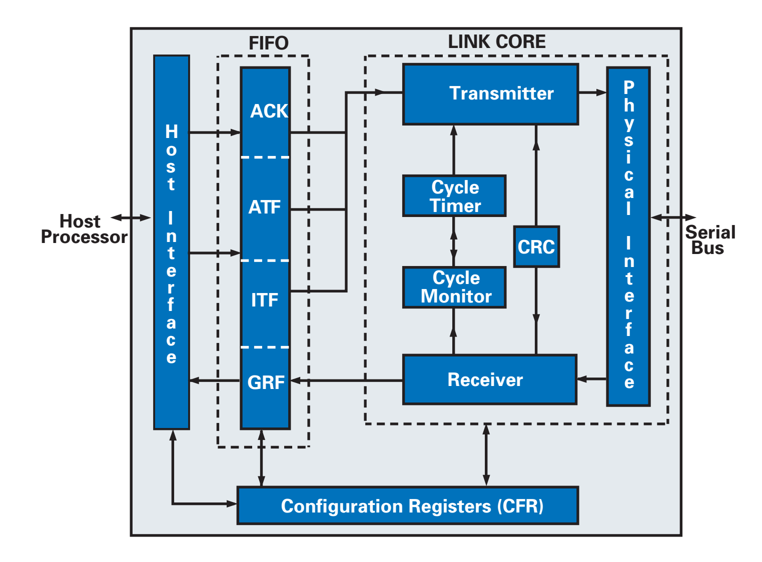
TSB42AC3是1394-1995多用途链路层器件，是各类应用的理想选择。TSB42AC3提供了高性能接口，可在32位主控制器和1394物理-链路层接口之间进行数据传输。1394物理-链路层接口提供至1394器件的连接。LLC负责对FIFO和物理-链路层接口之间的1394分组数据收发进行控制，其速率可为50(仅背板)、100、200和400Mbps。

### 主要特点

- 通用32位、50MHz主机总线接口
- 总共有10K字节可编程容量可用于异步、同步和通用FIFO
- 分离的ACK FIFO寄存器减轻了主机上的SCK跟踪工作量
- 至各引脚的附加可编程状态输出
- 与TSB12LV01B的软件全面兼容
- 用于支持板级扫描测试的IEEE1149.1 JTAG接口

### 应用

- 电机/运动/流程控制
- 工业成像




*TSB42AC3原理框图*

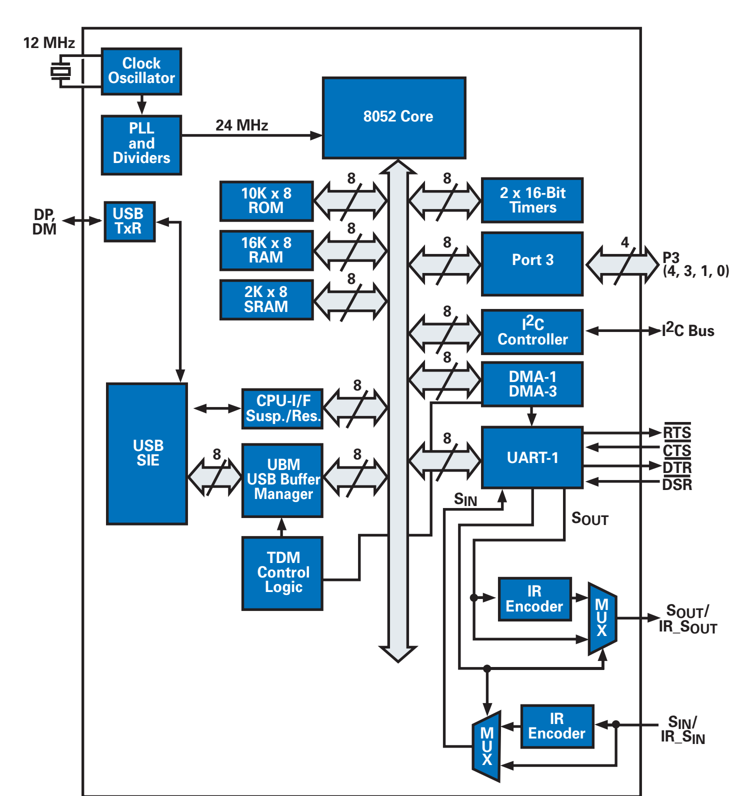
## USB至串行桥接器 TUSB3410

敬请访问**www.ti.com/sc/device/TUSB3410**, 以获取样片、数据表、评估板和应用报告。

TUSB3410 提供了一种简单的方法将您的 UART 设备用于快速、灵活的 USB 接口,就是在 USB 接口与增强型 UART 串行接口之间进行桥接。TUSB3410 包含所有采用 USB 总线来与主计算机进行通信所需的全部逻辑电路。TUSB3410 可被用在老式串行外设与具有 USB 端口的 PC（比如没有老式配置的 PC）之间的接口构建。评估模块能够令您的 USB 开发实现跨越式起步，您也可以将其用作完整的 USB 至 RS-232 转换器。

### 主要特点

- 内置、双通道DMA控制器，用于USB/UART大数据量I/O口
- 增强型 UART 功能，包括可编程软件/硬件流程控制和自动 RS-485 总线收发器控制（带或不带回送功能）




*TUSB3410总共可用于支持三个输入及输出（中断、批量）终端。*

## 厂区通信

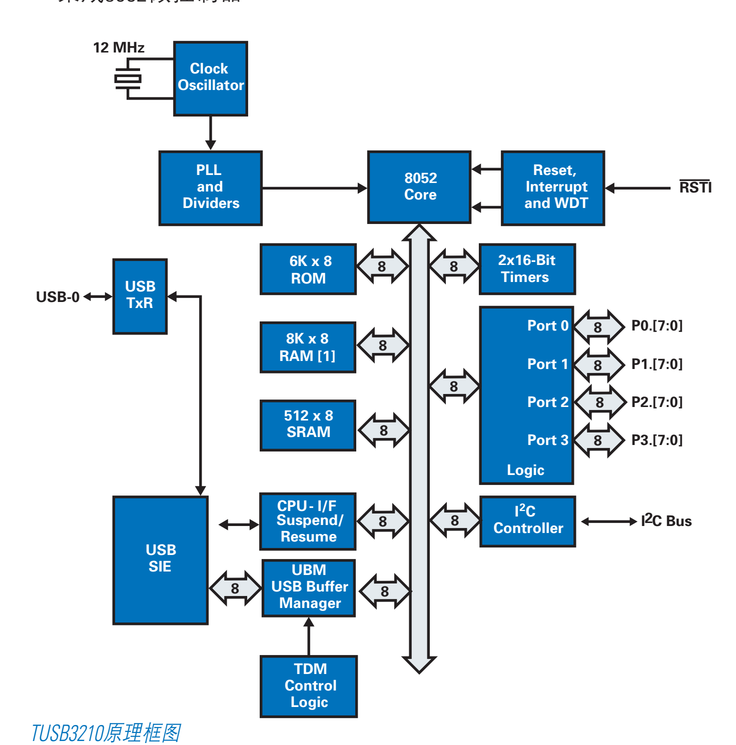
### 具有MCU GPIO、基于USB的控制器
### TUSB3210

敬请访问**www.ti.com/sc/device/TUSB3210**, 以获取样片、数据表、评估板和应用报告。

TUSB3210是基于USB的控制器，具有通用型业界标准8052 MCU和32 GPIO。它包含了用于应用程序开发的8K×8的RAM存储空间。TUSB3210是可编程器件，因而具有足够的灵活性以供多种通用USB I/O应用。

**主要特点**

- 支持12Mbps USB数据速率(全速)
- 支持USB暂停/恢复和远程唤醒操作
- 集成8052微控制器




TUSB3210原理框图

### 具有64字节FIFO的四通道通用异步收发机(UART)
### TL16C754B

敬请访问**www.ti.com/sc/device/TL16C754B**, 以获取样片、数据表和相关应用报告。

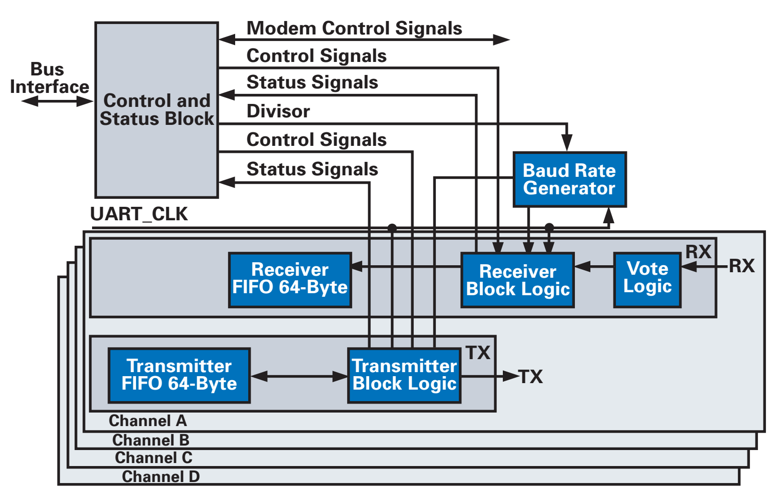
TI 空间节省、性能增强型 UART 的很多系列产品，与大多主要 UART 厂商器件的引脚兼容。

**主要特点**

- 可选3.3V及5V的工作电压
- 64字节可编程触发电平FIFO缓冲
- 高达3.2Mbps的数据传输率

**应用**

- 工业自动控制
- 基站
- 蜂窝电话
- 个人电脑




TL16C754B原理框图

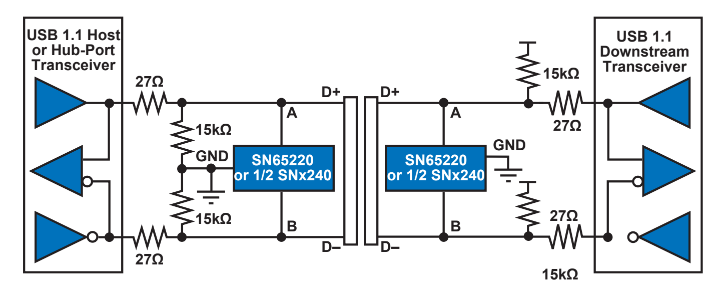
### USB端口瞬态抑制器
### SN65220、SN65240

敬请访问**www.ti.com/sc/device/SN65220**
或**www.ti.com/sc/device/SN65240**, 以获取样片、数据表及相关应用报告。

SN65220是单端口瞬态电压抑制器，SN65240 为双端口瞬态电压抑制器，其设计用于为全速 USB 端口提供电压瞬态保护。

**主要特点**

- 设计用于保护USB主机，集线器(hub)或外设端口
- 封装模式：微小型WCSP Chip-Scale封装




SN65220原理框图



## 双通道16字节FIFOs通用异步收发机(UART) TL16C2550

敬请访问**www.ti.com/sc/device/TL16C2550**，以获取样片、数据表及相关应用报告。

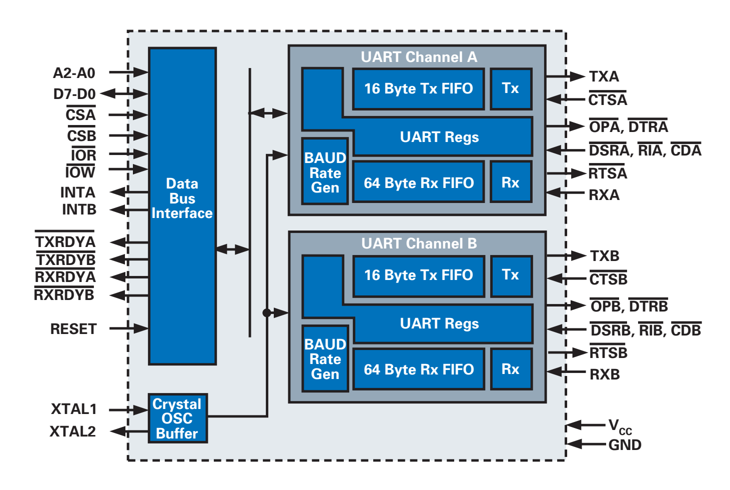
TL16C2550 是双通道通用异步接收机及发射机 (UART) 。此器件集成了两个 TL16C550D UART 的功能，每个UART 都具有其自身的寄存器组及 FIFO 端口。两个 UART 共享的仅有的数据总线接口及时钟源，除此以的外其他部分均独立运转。UART 的另一种称谓是异步通信单元 (ACE)，此类称谓具有一定的可互换性。

### 主要特点

- 运转性能可达：1.5Mbps(5V)、1.25Mbps(3.3V)、1Mbps(2.5V)
- 可编程的auto-RTS及auto-CTS（自动请求发送及清除发送）
- 可编程波特率发生器
- 封装模式：5mm x 5mm 32引脚 QFN封装(RHB)及48引脚 QFP封装

### 应用

- 销售点终端
- 游戏终端
- 便携式应用
- 路由控制
- 蜂窝式数据




*TL16C2550原理框图*

## 双通道64字节FIFO通用异步收发机 (UART) TL16C752B

敬请访问**www.ti.com/sc/device/TL16C752B**，以获取样片、数据表及相关应用报告。

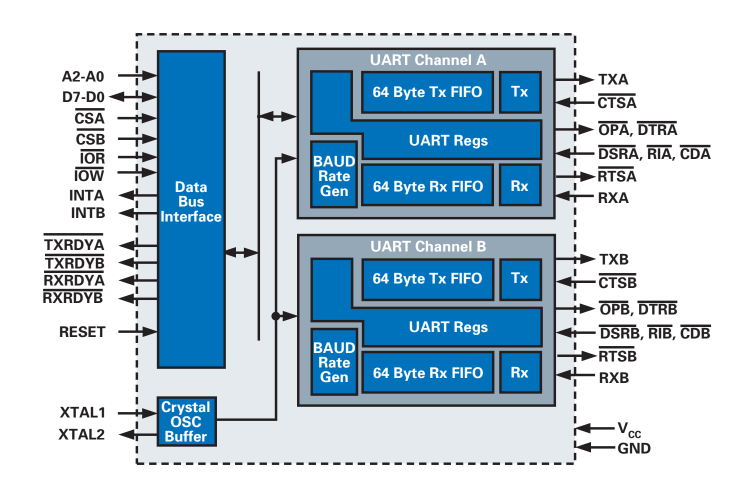
TL16C752B 是双通道通用异步接收机/发射机 (UART)，带64字节 FIFO 端口，自动硬件/软件自动流程控制，最高数据率可达3Mbps。TL16C752B 拥有强大的性能。它具有一个传输控制寄存器 (TCR) 用来存储 FIFO 门限电平，以用于硬件及软件流控制间的启动/停止传输。因为具有 FIFO RDY 寄存器，软件可通过一次访问就获得所有四个端口的 TXRDY/RXRDY 引脚状态。片上的状态寄存器可为使用者提供错误状态指示、工作状态指示、以及调制解调器接口控制。系统的中断也可为使用者量身定做，以便适用于各种要求。内置的回路反馈功能允许片上诊断。TL16C752B 采用 48-pin PT (LQFP) 封装。

### 主要特点

- TI专有的可编程auto-RTS及auto-CTS（自动请求发送及清除发送）
- $X_{ON}/X_{OFF}$软件流控制
- 3.3V时的传输波特率高达3Mbps
- 可编程及可选择性的发射/接收FIFO触发电平

### 应用

- 电信路由器
- 手持终端
- 移动计算设备
- 工厂自动化




*TL16C752B 原理框图*



## 厂区通信

### 器件推荐

| Device | Channel(s) | FIFOs | Voltage(V) | Characterized Temp (°C) | Package(s) | Description | Price[1] |
|---|---|---|---|---|---|---|---|
| TL16C2550 | 2 | 16-Byte | 2.5/3.3/5 | 0 to 70, –40 to 85 | 32-QFN, 44-PLCC, 48-TQFP | Dual UART with Programmable Auto-RTS and Auto-CTS | Call |
| TL16C2552 | 2 | 16-Byte | 2.5/3.3/5 | 0 to 70, –40 to 85 | 32-QFN, 44-PLCC | Dual UART with Programmable Auto-RTS and Auto-CTS | Call |
| TL16C450 | 1 | None | 5 | 0 to 70 | 40-DIP, 44-PLCC | Single UART | $1.50 |
| TL16C451 | 1 | None | 5 | 0 to 70 | 68-PLCC | Single UART with Parallel Port | $2.50 |
| TL16C452 | 2 | None | 5 | 0 to 70 | 68-PLCC | Dual UART with Parallel Port | $2.55 |
| TL16C550C | 1 | 16-Byte | 3.3/5 | 0 to 70, –40 to 85 | 40-DIP, 44-PLCC 48-LQFP, 48-TQFP | Single UART with Hardware Auto Flow Control | $1.75 |
| TL16C550D | 1 | 16-Byte | 2.5/3.3/5 | 0 to 70, –40 to 85 | 32-QFN, 48-LQFP, 48-TQFP | Single UART with Hardware Auto Flow Control | $1.75 |
| TL16C552 | 2 | 16-Byte | 5 | 0 to 70 | 68-PLCC | Dual UART with Parallel Port, Recommend TL16C552A | $3.90 |
| TL16C552A | 2 | 16-Byte | 5 | 0 to 70, –40 to 85 | 68-PLCC, 80-TQFP | Dual UART with Parallel Port | $3.85 |
| TL16C554 | 4 | 16-Byte | 5 | 0 to 70, –40 to 85 | 68-PLCC, 80-LQFP | Quad UART, Recommend TL16C554A | $6.05 |
| TL16C554A | 4 | 16-Byte | 5 | 0 to 70, –40 to 85 | 68-PLCC, 80-LQFP | Quad UART with Hardware Auto Flow Control | $6.00 |
| TL16C750 | 1 | 16-, 64-Byte | 5 | 0 to 70, –40 to 85 | 44-PLCC, 64-LQFP | Single UART with Hardware Auto Flow Control Lower Power Modes | $3.70 |
| TL16C752B | 2 | 64-Byte | 3.3 | 0 to 70, –40 to 85 | 48-LQFP, 48-TQFP | Dual UART with Hardware Auto Flow Control Lower Power Modes | $3.10 |
| TL16C752C | 2 | 64-Byte | 2.5/3.3/5 | 0 to 70, –40 to 85 | 32-QFN, 48-TQFP | Dual UART with Hardware Auto Flow Control Lower Power Modes, RS-485 and IrDA interface | Call |
| TL16C754B | 4 | 64-Byte | 3.3/5 | 0 to 70, –40 to 85 | 68-PLCC, 80-LQFP | Dual UART with Hardware Auto Flow Control Lower Power Modes | $8.35 |
| **TL16C754C** | 4 | 64-Byte | 2.5/3.3/5 | 0 to 70, –40 to 85 | 80-LQFP | Dual UART with Hardware Auto Flow Control Lower Power Modes | Call |
| TL16PC564B/BLV | 1 | 16-, 64-Byte | 3.3/5 | 0 to 70 | 100-BGA, 100-LQFP | Single UART with PCMCIA Interface | $5.90/$6.10 |
| TL16PIR552 | 2 | 16-Byte | 5 | 0 to 70 | 80-QFP | Dual UART with Selectable IR & 1284 Modes | $6.10 |

[1] 推荐零售价为每1000片时的美元价格。

前瞻性器件以**粗体蓝色**标明。



在许多应用中，传感器与由其提供数据的系统之间需要 (甚至必要的) 非直接的 (导电) 电连接，从而在提供数据的同时避免来自系统某一部分的危险电压 (或电流) 对其另一部分造成损害。这种系统被称为 "隔离" 型，而未接电的情况下阻碍信号传递的区域则被称作 "绝缘势垒" 。

绝缘势垒的保护作用是双向的，对于系统的两个组成部分来说，或许只有一个部分需要这种保护，也或许两个部分都需要。要求进行隔离保护的常见应用是那些传感器有可能偶尔遭遇高电压、而这个由传感器驱动的系统又是必须加以保护的场合。也有可能需要将传感器与出现在下游电路中的意外高压加以隔离，以保护其周围环境：例如包括防止由传感器所在区域的火花引起易爆气体燃烧或保护患者免遭 ECG、EEG 和 EMG 测试和监测设备的电击。ECG 应用可能需要双向绝缘势垒：即必须保护患者免遭心脏除颤器所施加的高电压 (>7.5kV) 的电击，并防止操作设备的技术人员承受意外反馈电压。

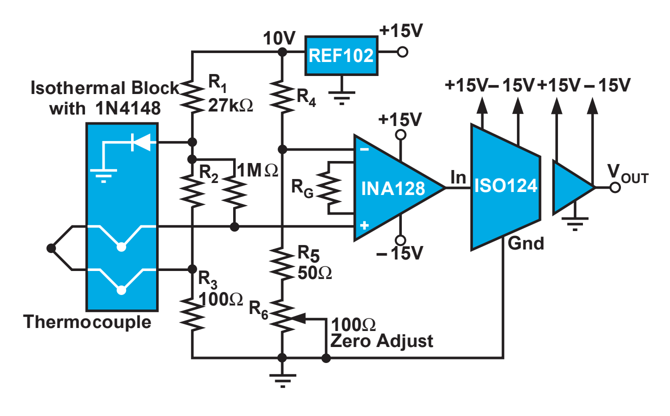
### 隔离放大器应用

- 传感器相对其他电路处于高电位(或在故障条件下有可能变得如此)的场合
- 不管其他电路出现什么故障(比如患者监控设备以及原本安全的设备使用时遇到易爆气体)，传感器都不能承受危险电压的场合
- 接地环路中断的场合

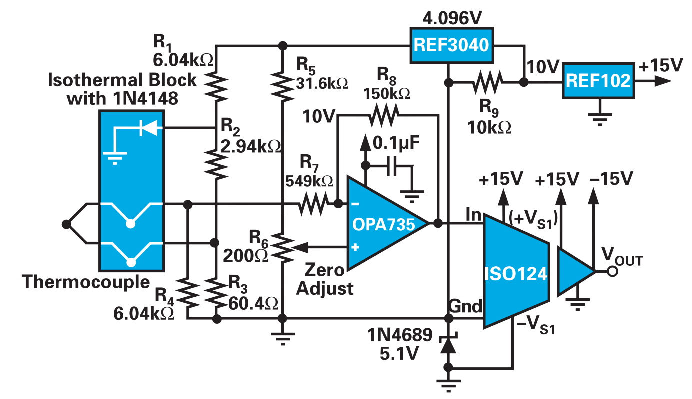
### 隔离放大器的设计

隔离放大器的设计困难包括偏置、漂移、增益精确性、非线性度或失真。高性能隔离放大器采用线性光电耦合器(LOC)，或者是运用数字电容隔离技术的调制器，这两种器件均采用差分方式来实现，以便在大信号范围内提高线性度。隔离放大器采用双反馈电路拓扑结构来大幅度地降低失真。

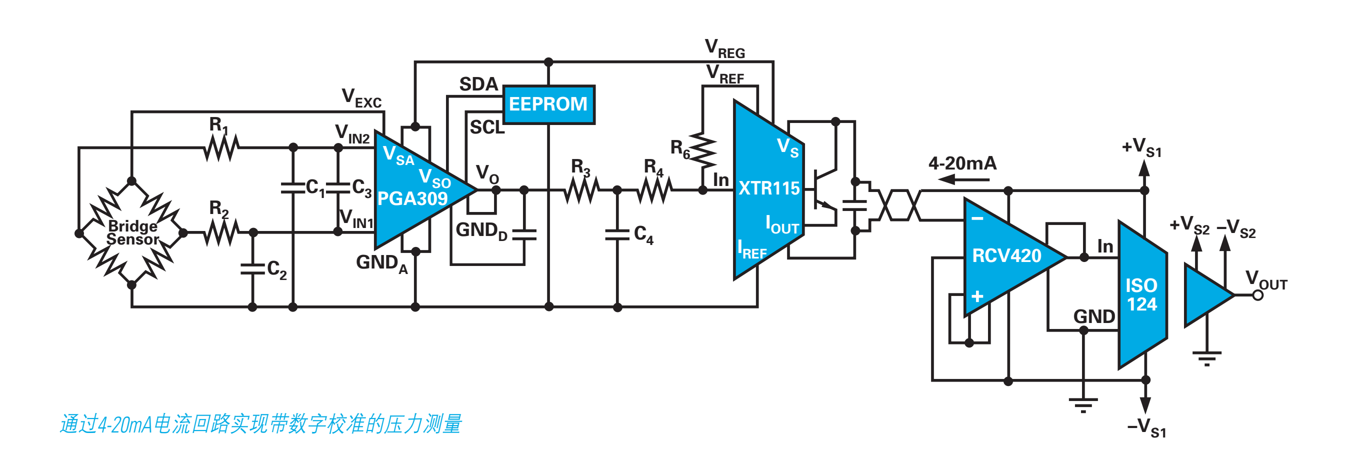
虽然通过势垒的反馈可以对这些误差进行校正，但它只在势垒两侧的电路精确匹配时才能做到这一点。由于电路并不处在同一块芯片上，因此难以实现。在集成电路隔离放大器中，输出和反馈解调器是由同一块硅晶圆片的 "相邻" 小片制成的，因此实现了优于分立型设计的匹配性。




双电源隔离温度测量




单电源隔离温度测量




通过4-20mA电流回路实现带数字校准的压力测量

## 数字耦合器及绝缘放大器

### 电隔离解决方案

系统设计师必须处理会影响或破坏系统性能的电源质量低劣、接地故障和雷击等各种问题。此外，网络节点的间距可能相当大，且常常由不同接地区域的 AC 插座来给这些节点供电。这些接地区域之间的电位差可能含有 DC偏压、50 或 60Hz 的 AC 谐波和各种瞬态噪声分量。

如果通过电缆逻辑接地或屏蔽将这些地线连接在一起，则可能形成接地环路，且电流将流入该电缆。接地环路电流会对网络产生严重影响，包括数据恶化、EMI过大、元件损坏，当电位差足够大时，人体就有遭受电击的危险。

新型磁耦合隔离技术依然存在着像缺乏故障保险输出、无法处理仅含直流分量的信号、以及工作温度范围受限这些老问题。同时，与感应器的新型连接还带来了易受外部磁场影响，以及随机出现的高压情况缩减了使用寿命等一系列新问题。

TI的隔离解决方案是专为消除与现有隔离技术相关的问题而设计的。常见的问题有高功耗、缺乏故障保险输出、低信号传输速率以及高脉宽失真等。采用光电耦合器时，由于接通光电晶体管所需的电流量随器件的老化而增加，因此光电转换的低效率问题变得尤为突出。这是因为LED的光发射效率会随着其使用时间的增加而下降，而且高工作温度还会加剧这种情况。

ISO721和ISO722提供的隔离解决方案解决了所有这些问题。TI目前正在开发的其他隔离产品包括多通道隔离器、隔离式CAN及RS-485收发器、隔离运算放大器、隔离数据转换器和隔离门控制器接口。

### 3.3V高速数字隔离器
### ISO721

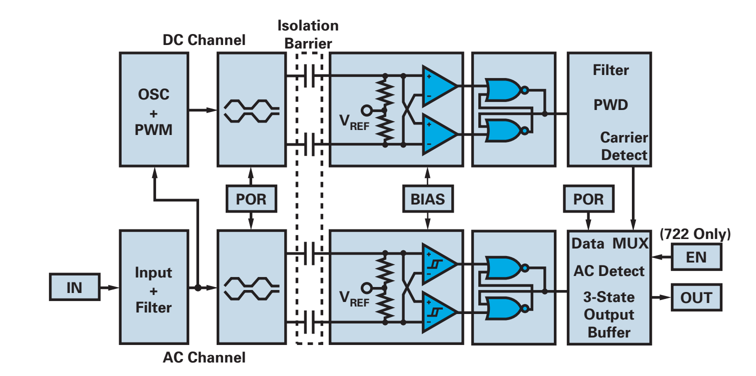
敬请访问**www.ti.com/sc/device/ISO721**，以获取样片、数据表及相关应用报告。

ISO721 数字隔离器是逻辑输入和输出缓冲器，由提供高达 4000V 电隔离的二氧化硅 ($SiO_2$) 绝缘势垒分开。当与隔离电源一道使用时，该器件可防止数据总线或其他电路上的噪声电流进入本机接地以及干扰或损坏敏感电路。

二进制输入信号在被调节并转换为平衡信号之后，由电容性绝缘势垒对其进行差分。在绝缘势垒的两端，差分比较器将接收逻辑变换信息，然后相应地对触发器和输出电路进行置位或复位操作。通过发送一个能穿过绝缘势垒的周期性刷新脉冲，以确保正确的输出直流电平。如果在超过 4 μs 的时间里未接收到该 DC 刷新脉冲，则认为输入没工作或无效，故障保险电路将把输出驱动至逻辑高电平状态。

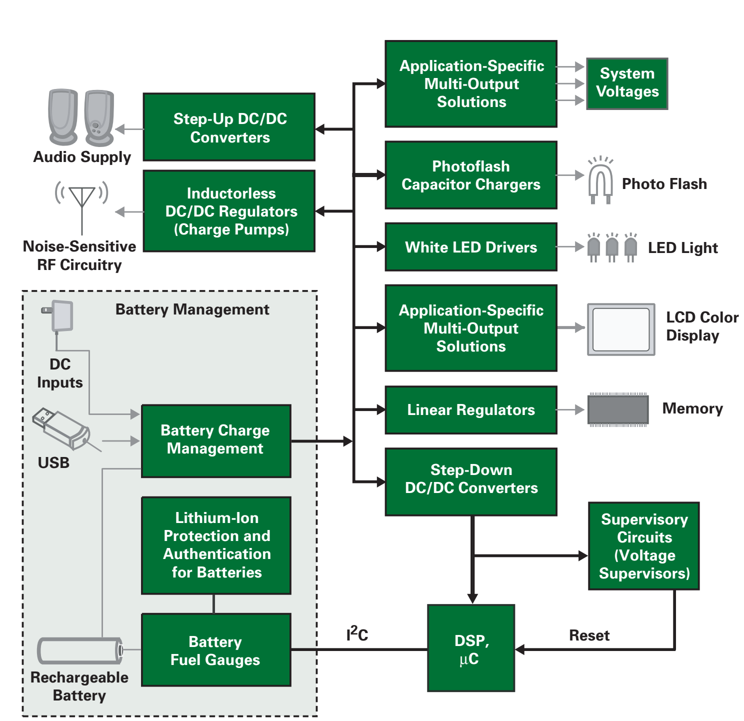
#### 主要特点

- 4000V隔离
- 故障保险输出
- 信号传输速率高达100Mbps
- 通过了UL1577、IEC60747-5-2(VDE 0884第二版)、IEC61010-1和CSA标准的认证
- 可承受25kV/ μs的瞬变




*ISO721 原理框图*





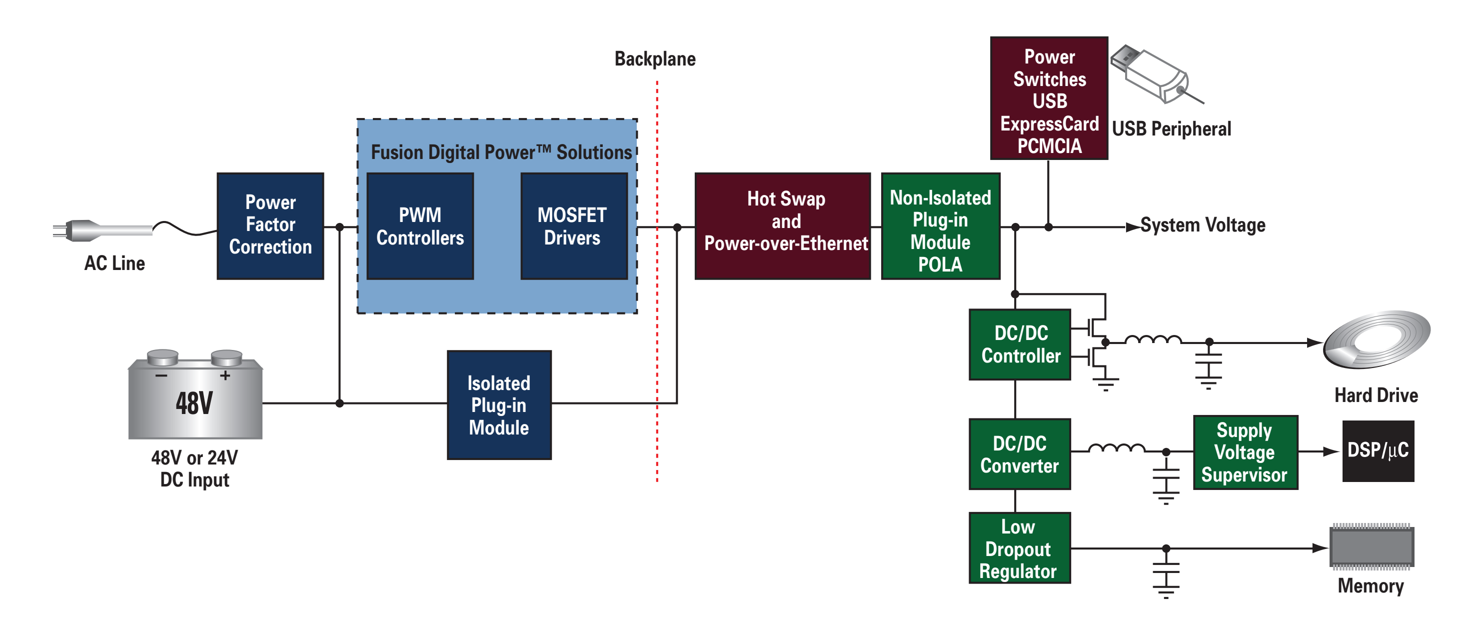

## 电源管理解决方案

| Device | Description |
|---|---|
| **Battery Chargers** | |
| bq2002 | NiMH/NiCd Charger for Current-Limited Power Supplies |
| bq2057 | 1- to 2-Cell Linear Li-Ion Charge Controller in MSOP |
| bq24100 | 1- to 3-Cell Li-Ion Fully Integrated Switch-Mode Charger in QFN |
| bq24200 | 1-Cell Li-Ion Fully Integrated Charger for Current-Limited Power Supplies |
| bq24010 | 1-Cell Li-Ion Fully Integrated Charger in QFN |
| bq24020 | 1-Cell Li-Ion Fully Integrated Charger for AC/DC Adapter and USB in QFN |
| bq24030 | 1-Cell Li-Ion Charger for AC/DC Adapter and USB with Dynamic Power Path Management in QFN |
| bq25010 | Single-Chip Li-Ion Charger with Adjustable DC/DC Converter in QFN |
| **Battery Fuel Gauges** | |
| bq26220 | 1- to 2-Cell Li-Ion Battery Monitor with HDQ Interface |
| bq27000 | 1- to 2-Cell Li-Ion Battery Fuel Gauge with HDQ in QFN and WCSP |
| bq27200 | 1- to 2-Cell Li-Ion Battery Fuel Gauge with I²C in QFN and WCSP |
| bq20z80 | 2- to 4-Cell Li-Ion SMBus Battery Fuel Gauge with Impedance Track™ Technology |
| bq2084 | 2- to 4-Cell Li-Ion SMBus Battery Fuel Gauge |
| **Battery Authentication and Protection** | |
| bq26150 | CRC-Based Battery Authentication IC |
| **DC/DC Buck (Step-Down) Solutions for Core and I/O** | |
| TPS62200 | 300mA, 1MHz Step-Down Converter with 12µA Quiescent Current in SOT-23 |
| TPS62220 | 400mA, 1.25MHz Step-Down Converter with 15µA Quiescent Current in ThinSOT-23 |
| TPS62300 | 500mA, 3MHz High-Accuracy Step-Down Converter with 1µH inductor in WCSP and QFN |
| TPS62050 | 800mA, 10V $V_{IN}$ Step-Down Converter with 12µA Quiescent Current in QFN-10 |
| TPS62040 | 1.2A, 1.25MHz Step-Down Converter with 18µA Quiescent Current in QFN-10 |
| TPS64200 | 3A Step-Down Controller in SOT-23 |
| TPS62110 | Adjustable, 17$V_{IN}$ and 1.5$A_{OUT}$ Step-Down DC/DC Converter in 4x4 QFN |
| TPS63700 | Adjustable, Up to –15$V_{OUT}$, Inverting DC/DC Converter in 3x3 QFN |

## 电源管理解决方案（续）

| Device | Description |
|---|---|
| **Linear Regulators (LDO)** | |
| TPS79718 | 10mA, 1.2µA Micro-Power LDO in SC-70 |
| TPS71533 | 50mA, 3.2µA Micro-Power LDO in SC-70 |
| TPS76301 | 100mA, Low-Cost LDO in SOT-23 |
| TPS72118 | 150mA, Low-Noise, Low-$V_{IN}$ LDO in SOT-23 |
| TPS79301 | 200mA, Low-Noise, High PSRR LDO in SOT-23 and WCSP |
| TPS79901 | 200mA, Ultra-Low Noise, High PSRR LDO in WCSP |
| TPS71157 | 250mA, Dual Output, Ultra-Low Noise, High PSRR LDO in WCSP |
| TPS73601 | 400mA, Cap-Free, Reverse-Leakage Protection LDO in SOT-23 and QFN |
| TPS79501 | 500mA, Low-Noise, High PSRR LDO in SOT-223 |
| TPS79601 | 1A, Low-Noise, High PSRR LDO in SOT-223 |
| **LED Backlight and Camera Flash Solutions** | |
| TPS61041 | 250mA Switch Boost Converter, up to 28V in SOT-23 |
| TPS61042 | 500mA Switch, Current-Regulated Boost Converter in QFN |
| TPS61060 | 375mA Switch, Current-Regulated, Synchronous Boost Converter in QFN and WCSP |
| REG71055 | Low-Cost Charge Pump for Up to 3 Parallel White LED in ThinSOT-23 |
| TPS60230 | 5-Channel, Current-Regulated White LED Charge Pump in QFN |
| TPS60231 | 3-Channel, Current Regulated White LED Charge Pump in QFN |
| TPS65552A | Xenon FLASH Charger for Digital Still Cameras with Integrated IGBT Driver |
| TPS61020 | 1.5A Switch Boost Converter in QFN for White LED FLASH |
| **DC/DC Boost (Step-Up) Solutions** | |
| TPS61041 | 250mA Switch Boost Converter, Up to 28V in SOT-23 |
| TPS61040 | 400mA Switch Boost Converter, Up to 28V in SOT-23 |
| TPS61070 | 600mA Switch Boost Converter in ThinSOT-23 for 1- and 2-Cell Alkaline Applications |
| TPS61010 | 1A Switch Boost Converter |
| TPS61020 | 1.5A Switch Boost Converter in QFN |
| TPS61030 | 4A Switch Boost Converter in QFN |
| **Display Power Solutions** | |
| TPS61045 | 375mA Switch Boost Converter, Up to 28V in QFN |
| TPS65110 | 3-Channel Small Form-Factor LTPS Display Power Supply in QFN |
| TPS65120 | 4-Channel Small Form-Factor TFT Display Power Supply in QFN |
| TPS65130 | 2-Channel, Positive/Negative Power Supply for OLED Displays in QFN |
| TPS65100 | 4-Channel Large Form-Factor TFT Display Power Supply |
| **Supply Voltage Supervisors** | |
| TPS3836E18 | 250nA, Supply Voltage Supervisor in SOT-23 |
| TPS3808G01 | 2.4µA, Programmable Delay Supply Voltage Supervisor in SOT-23 |
| TPS3801-01 | 9µA, Ultra-Small Supply Voltage Supervisor in SC-70 |
| TPS3110E12 | 1.2µA, Dual Supply Voltage Supervisor in SOT-23 |
| TPS3806I33 | 3µA, Dual Supply Voltage Supervisor in SOT-23 |
| **Complete Power Management Units** | |
| TPS65010 | 1-Cell Li-Ion Charger, 1.2A and 400mA Step-Down Converter, 2 LDO with I²C in QFN |






## 针对工业应用的系统电源解决方案

| Device | Description |
|---|---|
| **DC/DC Controllers** | |
| TPS40057 | Wide Input (8V-40V) Up to 1MHz Frequency Synchronous Buck Controller, Source/Sink with Prebias |
| TPS40061 | Wide Input (10V-55V) Up to 1MHz Frequency Synchronous Buck Controller, Source/Sink |
| TPS40100 | Midrange Input (4.5V-18V) Synchronous Buck Controller with Advanced Sequencing and Output Margining |
| TPS40200 | 8-Pin SO, 4.5-52V Cost Optimized Buck |
| TPS43000 | Multi-Topology (Buck, Boost, Sepic) High Frequency DC/DC Controller |
| UC3572 | Negative Output Flyback Pulse Width Modulator |
| **DC/DC Converters** | |
| TPS54110 | 3V to 6V Input, 1.5A Output Synchronous-Buck PWM Switcher |
| TPS54310 | 3V to 6V Input, 3A Output Synchronous-Buck PWM Switcher with Integrated FETs |
| TPS54350 | 4.5V to 20V Input, 3A Output Synchronous-Buck PWM Switcher with Integrated FET |
| TPS54610 | 3V to 6V Input, 6A Output Synchronous-Buck PWM Switcher with Integrated FETs |
| **PWM Controllers** | |
| UCC38C42 | BiCMOS Low-Power Current Mode PWM Controller |
| UCC3809 | Economy Primary Side Controller |
| UCC3813 | Low Power Economy BiCMOS Current Mode PWM |
| **MOSFET Drivers** | |
| UCC27323 | Dual 4A Peak, High-Speed Low-Side Power MOSFET Drivers |
| UCC27423 | Dual 4A, High-Speed Low-Side MOSFET Drivers with Enable |
| **Hot Swap Controllers** | |
| TPS2490/1 | +9V to +80V Positive High-Voltage Power-Limiting Hot Swap Controller |
| TPS2393 | Full Featured –48V Hot Swap Power Manager |
| TPS2391 | Simple –48V Hot Swap Controller |
| **Power-over-Ethernet (PoE)** | |
| TPS2375 | IEEE 802.3af PoE Powered Device Controllers |
| TPS23750 | IEEE 802.3af PD Controller with Integrated DC/DC |
| TPS2384 | Quad Ethernet Power Sourcing Equipment Power Manager |

## 如何为您的工业应用提供电源?

TI提供了大量有关工业供电设计方案的在线信息。

### (1) 典型工业电源供应控制器

TPS40054/55/57和TPS40060/61是输入电压范围分别为8V-40V及10V-55V的同步降压型控制器系列。如需了解更多相关产品信息，敬请访问：
www.ti.com/sc/device/tps40054

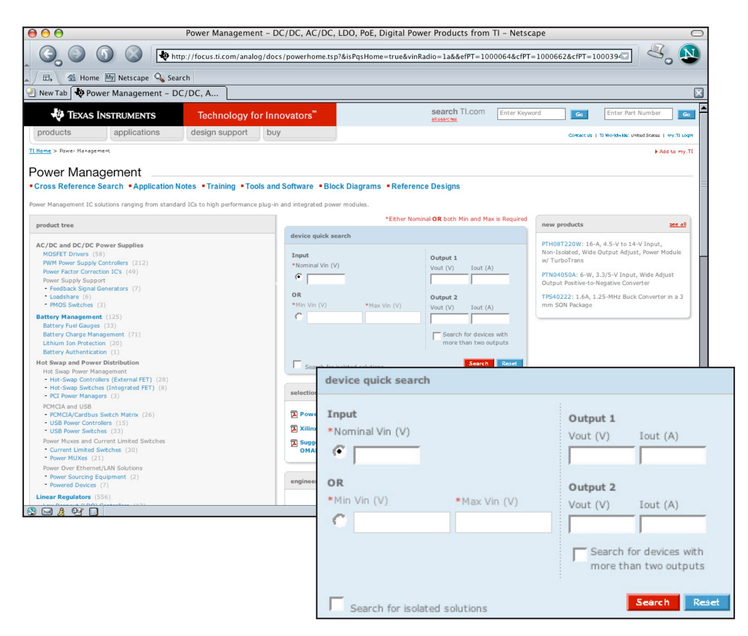
### (2) 针对经济型电源供应设计的控制器

TPS40200所提供的工业输出电压范围从4.5V至52V。其灵活的PWM控制架构使其成为成本最低廉的电源，并用于各类工业控制解决方案。

如需了解更多相关产品信息，敬请访问：
www.ti.com/sc/device/tps40200

### (3) 运用TI的PQS工具来选择合适的器件

登录power.ti.com网站，点击“Power Quick Search”按钮并键入所需的输入和输出电压。该工具可以从我们的诸多产品门类套件(包括DC/DC控制器、DC/DC变换器、低压差线性稳压器、PWM控制器以及完整的模块解决方案)中为您推荐合适的产品。




### (4) 参考设计资源

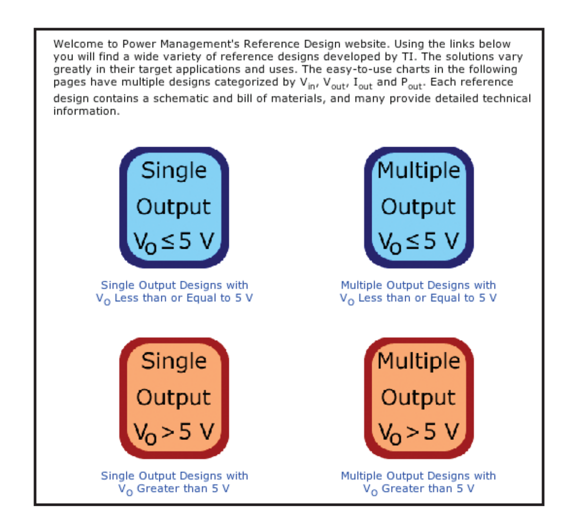
我们的参考设计主页提供了包括电路图表和详细材料清单在内的特色解决方案。

请登录power.ti.com网点，选择“Design Resources”，然后点击“Reference Design”即可。

### (5) 您知道采用哪种架构合适吗?

如需了解电源拓扑结构布置，敬请访问：http://focus.ti.com/lit/ml/sluw001/sluw001.pdf，以下载针对每种拓扑结构的典型电源器件。

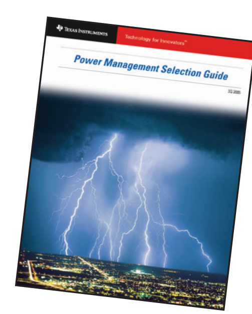
如需了解应用解决方案手册，敬请访问：http://focus.ti.com/lit/ml/slub007/slub007.pdf，以下载相关的应用手册。




### (6) 《电源管理选择指南》

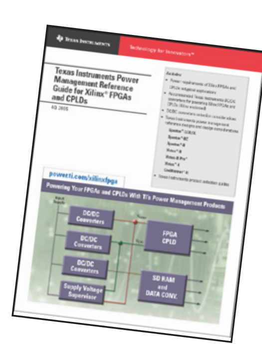
本指南对TI公司门类宽泛的电源产品库进行了全面概述。

敬请登录
http://power.ti.com/selectionguide
网站以下载相关指南。




### (7) Xilinx及Altera FPGA的供电

TI提供了各种用于对Altera®和Xilinx®FPGA的内核和I/O电压供电的即用型解决方案。通过Altera(www.ti.com/alterafpga)和Xilinx(www.ti.com/xilinxfpga)产品的网页可查阅《电源管理参考指南》，并提供了针对每款设计的电路图表及材料清单的下载。





## 放大器

### 差分放大器选择指南

| Device | Description | Spec Temp Range | Ch. | Gain | Offset (µV) (max) | Offset Drift (µV/°C) (max) | CMRR (dB) (min) | BW (MHz) (typ) | Output Voltage Swing (V) (min) | Power Supply (V) | $I_Q$ (mA) (max) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **General Purpose** | | | | | | | | | | | | | |
| **INA159** | High-Speed, Single Supply | EI[2] | 1 | 0.2 | 500 | 1.5 (typ) | 86 | 1.5 | (V+) – 0.1 to (V–) +0.048 | 1.8 to 5.5 | 1.4 | MSOP-8 | $1.60 |
| INA132 | Micropower, High-Precision | I[2] | 1, 2 | 1 | 250 | 5 | 76 | 0.3 | (V+) – 1 to (V–) + 0.5 | +2.7 to +36 | 0.185 | DIP, SO | $1.05 |
| INA133 | High-Precision, Fast | I[2] | 1, 2 | 1 | 450 | 5 | 80 | 1.5 | (V+) – 1.5 to (V–) + 1 | ±2.25 to ±18 | 1.2 | SOIC-8/-14 | $1.05 |
| INA143 | High-Precision, G = 10 or 0.01 | I[2] | 1, 2 | 10, 0.1 | 250 | 3 | 86 | 0.15 | (V+) – 1 to (V–) + 0.5 | ±2.25 to ±18 | 1.2 | SOIC-8/-14 | $1.05 |
| INA145 | Resistor Programmable Gain | I[2] | 1, 2 | 1-1000 | 1000 | 103 | 76 | 0.5 | (V+) – 1 to (V–) + 0.5 | ±1.35 to ±18 | 0.7 | SOIC-8 | $1.50 |
| INA152 | Micropower, High-Precision | I[2] | 1 | 1 | 750 | 5 | 86 | 0.7 | (V+) – 0.2 to (V–) + 0.2 | +2.7 to +20 | 0.65 | MSOP-8 | $1.20 |
| INA154 | High-Speed, Precision, G = 1 | I[2] | 1 | 1 | 750 | 20 | 80 | 3.1 | (V+) – 2 to (V–) + 2 | ±4 to ±18 | 2.9 | SOIC-8 | $1.05 |
| INA157 | High-Speed, G = 2 or 0.5 | I[2] | 1 | 2, 0.5 | 500 | 20 | 86 | 4 | (V+) – 2 to (V–) + 2 | ±4 to ±18 | 2.9 | SOIC-8 | $1.05 |
| **Audio** | | | | | | | | | | | | | |
| INA134 | Low Distortion: 0.0005% | I[2] | 1, 2 | 1 | 1000 | 2[3] | 74 | 3.1 | (V+) – 2 to (V–) + 2 | ±4 to ±18 | — | SOIC-8/-14 | $1.05 |
| INA137 | Low Distortion, G = 0.5 or 2 | I[2] | 1, 2 | 2, 0.5 | 1000 | 2[3] | 74 | 4 | (V+) – 2 to (V–) + 2 | ±4 to ±18 | 2.9 | SOIC-8/-14 | $1.05 |
| **High Common-Mode Voltage** | | | | | | | | | | | | | |
| INA117 | ±200V CM Range | I[2] | 1 | 1 | 1000 | 20 | 86 | 0.2 | (V+) – 5 to (V–) + 5 | ±5 to ±18 | — | SOIC-8 | $2.70 |
| INA146 | ±100V CM Range, Prog. Gain | I[2] | 1 | 0.1-100 | 5000 | 100[3] | 70 | 0.55 | (V+) – 1 to (V–) + 0.1 5 | ±1.35 to ±18 | 0.7 | SOIC-8 | $1.70 |
| INA148 | ±200V CM Range, 1MΩ Input | I[2] | 1 | 1 | 5000 | 100[3] | 70 | 0.1 | (V+) – 1 to (V–) + 0.2 5 | ±1.35 to ±18 | 0.3 | SOIC-8 | $2.10 |
| **High-Side Current Shunt Monitors** | | | | | | | | | | | | | |
| INA138 | 36V (max) | EI[2] | 1 | 200µA/V | 1000 | 1[3] | 100 | 0.8 | 0 to (V+) – 0.8 | +2.7 to 36 | 0.045 | SOT23-5 | $0.99 |
| INA139 | High-Speed, 40V (max) | EI[2] | 1 | 1-100 | 1000 | 1 | 100 | 4.4 | 0 to (V+) – 0.9 | +2.7 to 40 | 0.125 | SOT23-5 | $0.99 |
| INA168 | 60V (max) | EI[2] | 1 | 200µA/V | 1000 | 1[3] | 100 | 0.8 | 0 to (V+) – 0.8 | +2.7 to 60 | 0.045 | SOT23-5 | $1.25 |
| INA169 | High-Speed, 60V (max) | EI[2] | 1 | 1-100 | 1000 | 1 | 100 | 4.4 | 0 to (V+) – 0.9 | +2.7 to 60 | 0.125 | SOT23-5 | $1.25 |
| INA19x | –16V to 36V CM Range | EI[2] | 1 | 100V/V | 2000 | 1 | 100 | 0.4 | 0.4 (V+) – 0.1 | +2.7 to 13.5 | 0.9 | SOT23-5 | $0.80 |
| INA170 | High-Side, Bi-Directional | I[2] | 1 | 1-100 | 1000 | 1 | 100 | 0.4 | 0 to (V+) – 0.9 | +2.7 to 60 | 0.125 | MSOP-8 | $1.25 |

[1] 推荐零售价为每1000片时的美元价格。 [2] I = -40°C至+85°C； EI = -40°C至 +125°C. [3] 表示单电源。

新产品以**粗体红色**标明。

### 对数放大器选择指南

| Device | Spec[2] Temp Range | Scale Factor (V/decade) | Input Current Range (nA) (min) | Input Current Range (mA) (max) | Conformity Error (Initial 5 Decades) (%) (max) | Conformity Error (Initial 5 Decades) (%/°C) (typ/temp) | Offset Voltage (Input Amplifiers) (mV) (max) | $V_S$ (V) (min) | $V_S$ (V) (max) | $I_Q$ Per Ch. (mA) (max) | Reference Type | Auxiliary Op Amps | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOG101 | C3 | 1 | 0.1 | 3.5 | 0.2 | 0.0001 | 1.5 | ±4.5 | ±18 | 1.5 | External | — | SO-8 | $6.95 |
| LOG102 | C | 1 | 1 | 1 | 0.3 | 0.0002 | 1.5 | ±4.5 | ±18 | 2 | External | 2 | SO-14 | $7.25 |
| LOG104 | C3 | 0.5 | 0.1 | 3.5 | 0.2 | 0.0001 | 1.5 | ±4.5 | ±18 | 1.5 | External | — | SO-8 | $6.95 |
| LOG112 | C3 | 0.5 | 0.1 | 3.5 | 0.2 | 0.00001 | 1.5 | ±4.5 | ±18 | 1.75 | 2.5V Internal | 1 | SO-14 | $7.90 |
| LOG2112[3] | C3 | 0.5 | 0.1 | 3.5 | 0.2 | 0.00001 | 1.5 | ±4.5 | ±18 | 1.75 | 2.5V Internal | 1 | SO-16 | $11.35 |
| **LOG114** | C3 | 0.375 | 0.1 | 3.5 | 0.2 | 0.001 | 4 | ±2.25 | ±5 | 15 | 2.5V Internal | 2 | QFN-16 | $8.90 |

[1] 推荐零售价为每1000片时的美元价格。 [2] C = 0°C至70°C；C3 = -5°C至75°C。 [3] 双通道 LOG112。

前瞻性器件以**粗体蓝色**标明。

### 隔离放大器选择指南

| Device | Description | Spec[2] Temp Range | Isolation Voltage Cont Peak (DC) (V) | Isolation Voltage Pulse/ Test Peak (V) | Isolation Mode Rejection DC (dB) (typ) | Gain Nonlinearity (%) (max) | Input Offset Voltage Drift (±µV/°C) (max) | Small-Signal Bandwidth (kHz) (typ) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| ISO120 | 1500-Vrms Isolation, Buffer | WI | 2121 | 2500 | 160 | 0.01 | 150 | 60 | DIP-24 | $68.20 |
| ISO121 | 3500-Vrms Isolation, Buffer | I2 | 4950 | 5600 | — | 0.01 | — | 60 | CERDIP-16 | $66.35 |
| ISO122 | 1500-Vrms Isolation, Buffer | I2 | 2121 | 2400 | 160 | 0.02 | 200 | 50 | DIP-16, SOIC-28 | $9.40 |
| ISO124 | 1500-Vrms Isolation, Buffer | I2 | 2121 | 2400 | 140 | 0.01 | — | 50 | DIP-16, SOIC-28 | $7.20 |
| **Digital Couplers** | | | | | | | | | | |
| ISO150 | Dual, Bi-Directional Digital Coupler | I | 1500 | 2400 | — | — | — | — | DIP-12, SO-12 | $7.47 |

[1] 推荐零售价为每1000片时的美元价格。 [2] WI = -55°C至+125°C； I2 = -25°C至 +85°C； I = -40°C至 +85°C。



## 单电源仪表放大器选择指南

| Device | Description | Spec[2] Temp Range | Gain | Non Linearity (%) (max) | Input Bias Current (nA) (max) | Offset at G = 100 (µV) (max) | Offset Drift (µV/°C) (max) | CMRR at G = 100 (dB) (min) | BW at G = 100 (kHz) (min) | Noise at 1kHz (nV/√Hz) (typ) | Power Supply (V) | $I_Q$ per Amp (mA) (max) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Single-Supply, Low Power $I_Q$ < 525µA per Instrumentation Amp** | | | | | | | | | | | | | | |
| INA321 | RRO, SHDN, Low Offset, Gain Error | WI | 5 to 10000 | 0.01 | 0.01 | 1000 | 7[3] | 90 | 50 | 100 | 2.7 to 5.5 | 0.06 | MSOP-8 | $1.10 |
| INA2321 | Dual INA321 | WI | 5 to 10000 | 0.01 | 0.01 | 1000 | 7[3] | 90 | 50 | 100 | 2.7 to 5.5 | 0.06 | TSSOP-14 | $1.75 |
| INA322 | RRO, SHDN, Low Cost | WI | 5 to 10000 | 0.01 | 0.01 | 10000 | 7 | 60 | 50 | 100 | 2.7 to 5.5 | 0.06 | MSOP-8 | $0.95 |
| INA2322 | Dual INA322 | WI | 5 to 10000 | 0.01 | 0.01 | 10000 | 7 | 60 | 50 | 100 | 2.7 to 5.5 | 0.06 | TSSOP-14 | $1.50 |
| INA122 | µpower, RRO, CM to Ground | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 90 | 5 | 60 | 2.2 to 36 | 0.085 | SOIC-8 | $2.10 |
| INA332 | RRO, Wide BW, SHDN | WI | 5 to 1000 | 0.01 | 0.01 | 10000 | 7[3] | 60 | 500 | 100 | 2.7 to 5.5 | 0.1 | MSOP-8 | $0.85 |
| INA2332 | Dual INA332 | WI | 5 to 1000 | 0.01 | 0.01 | 10000 | 7[3] | 60 | 500 | 100 | 2.7 to 5.5 | 0.1 | MSOP-8 | $1.35 |
| INA126 | µpower, < 1V $V_{SAT}$, Low Cost | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 83 | 9 | 35 | 2.7 to 36 | 0.2 | SO/MSOP-8 | $1.05 |
| INA2126 | Dual INA126 | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 83 | 9 | 35 | 2.7 to 36 | 0.2 | SO/MSOP-16 | $1.70 |
| INA118 | Precision, Low Drift, Low Power[4] | I | 1 to 10000 | 0.002 | 5 | 55 | 0.7 | 107 | 70 | 10 | 2.7 to 36 | 0.385 | SOIC-8 | $4.15 |
| INA331 | RRO, Wide BW, SHDN | WI | 5 to 1000 | 0.01 | 0.01 | 500 | 5[3] | 90 | 2000 | 46 | 2.7 to 5.5 | 0.5 | MSOP-8 | $1.10 |
| INA2331 | Dual INA331 | WI | 5 to 1000 | 0.01 | 0.01 | 1000 | 5[3] | 80 | 2000 | 46 | 2.7 to 5.5 | 0.5 | TSSOP-14 | $1.80 |
| INA125 | Internal Ref, Sleep Mode[4] | I | 4 to 10000 | 0.01 | 25 | 250 | 2 | 100 | 4.5 | 38 | 2.7 to 36 | 0.525 | SOIC-16 | $2.05 |
| **Single-Supply, Low Input Bias Current $I_B$ < 100pA** | | | | | | | | | | | | | | |
| INA155 | Low Offset, RRO, SR = 6.5V/µs | WI | 10, 50 | 0.015 | 0.01 | 1000 | 5[3] | 86 | 110 | 40 | 2.7 to 5.5 | 2.1 | MSOP-8 | $1.10 |
| INA156 | Low Offset, RRO, Low Cost, SR = 6.5V/µs | WI | 10, 50 | 0.015 | 0.01 | 8000 | 5[3] | 86 | 110 | 40 | 2.7 to 5.5 | 2.1 | SOIC-8, MSOP-8 | $0.95 |
| INA321 | RRO, SHDN, Low Offset, Gain Error | WI | 5 to 10000 | 0.01 | 0.01 | 1000 | 7[3] | 90 | 50 | 100 | 2.7 to 5.5 | 0.06 | MSOP-8 | $1.10 |
| INA2321 | Dual INA321 | WI | 5 to 10000 | 0.01 | 0.01 | 1000 | 7[3] | 90 | 50 | 100 | 2.7 to 5.5 | 0.06 | TSSOP-14 | $1.75 |
| INA322 | RRO, SHDN, Low Cost | WI | 5 to 10000 | 0.01 | 0.01 | 10000 | 7 | 60 | 50 | 100 | 2.7 to 5.5 | 0.06 | MSOP-8 | $0.95 |
| INA2322 | Dual INA322 | WI | 5 to 10000 | 0.01 | 0.01 | 10000 | 7 | 60 | 50 | 100 | 2.7 to 5.5 | 0.06 | TSSOP-14 | $1.50 |
| INA331 | RRO, Wide BW, SHDN | WI | 5 to 1000 | 0.01 | 0.01 | 500 | 5[3] | 90 | 2000 | 46 | 2.7 to 5.5 | 0.5 | MSOP-8 | $1.10 |
| INA2331 | Dual INA331 | WI | 5 to 1000 | 0.01 | 0.01 | 1000 | 5[3] | 80 | 2000 | 46 | 2.7 to 5.5 | 0.5 | TSSOP-14 | $1.80 |
| INA332 | RRO, Wide BW, SHDN | WI | 5 to 1000 | 0.01 | 0.01 | 10000 | 7[3] | 60 | 500 | 100 | 2.7 to 5.5 | 0.1 | MSOP-8 | $0.88 |
| INA2332 | Dual INA332 | WI | 5 to 1000 | 0.01 | 0.01 | 10000 | 7[3] | 60 | 500 | 100 | 2.7 to 5.5 | 0.1 | TSSOP-14 | $1.35 |
| **Single-Supply, Precision $V_{OS}$ < 300µA, Low $V_{OS}$ Drift** | | | | | | | | | | | | | | |
| INA118 | Precision, Low Drift, Low Power[4] | I | 1 to 10000 | 0.002 | 5 | 55 | 0.7 | 107 | 70 | 10 | 2.7 to 36 | 0.385 | SOIC-8 | $4.15 |
| INA326 | RRIO, Auto Zero, CM > Supply, Low Drift | I | 0.1 to 10000 | 0.01 | 2 | 100 | 0.4 | 100 | 1 | 33 | 2.7 to 5.5 | 3.4 | MSOP-8 | $1.80 |
| INA327 | RRIO, Auto Zero, SHDN, CM > Supply, Low Drift | I | 0.1 to 10000 | 0.01 | 2 | 100 | 0.4 | 100 | 1 | 33 | 2.7 to 5.5 | 3.4 | MSOP-10 | $1.95 |
| INA337 | RRIO, Auto Zero, Low Drift, CM > Supply | EI | 0.1 to 10000 | 0.01 | 2 | 100 | 0.4 | 106 | 1 | 33 | 2.7 to 5.5 | 3.4 | MSOP-8 | $1.80 |
| INA338 | RRIO, Auto Zero, Low Drift, CM > Supply, SHDN | EI | 0.1 to 10000 | 0.01 | 2 | 100 | 0.4 | 106 | 1 | 33 | 2.7 to 5.5 | 3.4 | MSOP-10 | $1.95 |
| INA122 | µpower, RRO, CM to Ground | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 90 | 5 | 60 | 2.2 to 36 | 0.085 | SOIC-8 | $2.10 |
| INA125 | Internal Ref, Sleep Mode[4] | I | 4 to 10000 | 0.01 | 25 | 250 | 2 | 100 | 4.5 | 38 | 2.7 to 36 | 0.525 | SOIC-16 | $2.05 |
| INA126 | µpower, < 1V $V_{SAT}$, Low Cost | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 83 | 9 | 35 | 2.7 to 36 | 0.2 | SO/MSOP-8 | $1.05 |
| INA2126 | Dual INA126 | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 83 | 9 | 35 | 2.7 to 36 | 0.2 | SO/MSOP-16 | $1.70 |
| **Signal Amplifiers for Temperature Control** | | | | $I_B$ (nA) | | Temp Error[5] | | | 1/F Noise | | | | | |
| INA330 | Optimized for Precision 10K Thermistor Applications | I | — | — | 0.2[3] | — | 0.009°C[3] | — | 1 | 0.0001 °C pp | 2.7 to 5.5 | 3.6 | MSOP-10 | $1.55 |

[1] 推荐零售价为每1000片时的美元价格。 [2] WI = -55°C至+125°C；I = -40°C至+85°C；EI = -40°C至+125°C。 [3] 典型值。 [4] 内置+40V输入保护。 [5] -40°C至+85°C。



## 放大器

### 双电源仪表放大器选择指南

| Device | Description | Spec[2] Temp Range | Gain | Non Linearity (%) (max) | Input Bias Current (nA) (max) | Offset at G = 100 (μV) (max) | Offset Drift (μV/°C) (max) | CMRR at G = 100 (dB) (min) | BW at G = 100 (kHz) (min) | Noise at 1kHz (nV/√Hz) (typ) | Power Supply (V) | $I_Q$ per Amp (mA) (max) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dual-Supply, Low Power $I_Q$ < 850μA per Instrumentation Amp** | | | | | | | | | | | | | | |
| INA122 | μpower, RRO, CM to Ground | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 90 | 5 | 60 | ±1.3 to ±18 | 0.085 | DIP-8, SOIC-8 | $2.10 |
| INA126[3] | μpower, < 1V $V_{SAT}$, Low Cost | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 83 | 9 | 35 | ±1.35 to ±18 | 0.2 | DIP/SO/MSOP-8 | $1.05 |
| INA118 | Precision, Low Drift | I | 1 to 10000 | 0.002 | 5 | 55 | 0.7 | 107 | 70 | 10 | ±1.35 to ±18[4] | 0.385 | SOIC-8 | $4.15 |
| INA121 | Low Bias, Precision | I | 1 to 10000 | 0.005 | 0.05 | 500 | 5 | 100 | 50 | 20 | ±2.25 to ±18[4] | 0.525 | SO-8 | $2.50 |
| INA125 | Internal Ref, Sleep Mode[4] | I | 4 to 10000 | 0.01 | 25 | 250 | 2 | 100 | 4.5 | 38 | ±1.35 to ±18 | 0.525 | SOIC-16 | $2.05 |
| INA128[3] | Precision, Low Noise, Low Drift[4] | I | 1 to 10000 | 0.002 | 5 | 60 | 0.7 | 120 | 200 | 8 | ±2.25 to ±18 | 0.8 | SOIC-8 | $3.05 |
| INA129 | Precision, Low Noise, Low Drift AD620 Second Source[4] | I | 1 to 10000 | 0.002 | 5 | 60 | 0.7 | 120 | 200 | 8 | ±2.25 to ±18 | 0.8 | SOIC-8 | $3.05 |
| INA141[3] | Precision, Low Noise, Low Drift, Pin Compatible with AD6212[4] | I | 10, 100 | 0.002 | 5 | 50 | 0.7 | 110 | 200 | 8 | ±2.25 to ±18 | 0.8 | SOIC-8 | $3.05 |
| **Dual-Supply, Low Input Bias Current $I_B$ < 100pA** | | | | | | | | | | | | | | |
| INA110 | Fast Settle, Low Noise, Wide BW | C | 1,10,100, 200, 500 | 0.01 | 0.05 | 280 | 2.5 | 106 | 470 | 10 | ±6 to ±18 | 4.5 | CDIP-16 | $7.00 |
| INA121 | Precision | I | 1 to 10000 | 0.005 | 0.05 | 500 | 5 | 100 | 50 | 20 | ±2.25 to ±18[4] | 0.525 | SO-8 | $2.50 |
| INA111 | Fast Settle, Low Noise, Wide BW | I | 1 to 10000 | 0.005 | 0.02 | 520 | 6 | 106 | 450 | 10 | ±6 to ±18 | 4.5 | SO-16 | $4.20 |
| INA116 | Ultra Low $I_B$ 3 fA (typ), with Buffered Guard Drive Pins[4] | I | 1 to 10000 | 0.01 | 0.0001 | 5000 | 40 | 80 | 70 | 28 | ±4.5 to ±18 | 1.4 | SO-16 | $4.20 |
| **Dual-Supply, Precision $V_{OS}$ < 300μA, Low $V_{OS}$ Drift** | | | | | | | | | | | | | | |
| INA114 | Precision, Low Drift[4] | I | 1 to 10000 | 0.002 | 2 | 50 | 0.25 | 110 | 10 | 11 | ±2.25 to ±18 | 3 | SO-16 | $4.20 |
| INA115 | Precision, Low Drift, with Gain Sense Pins[4] | I | 1 to 10000 | 0.002 | 2 | 50 | 0.25 | 120 | 10 | 11 | ±2.25 to ±18 | 3 | SO-16 | $4.20 |
| INA131 | Low Noise, Low Drift[4] | I | 100 | 0.002 | 2 | 50 | 0.25 | 110 | 70 | 12 | ±2.25 to ±18 | 3 | PDIP-8 | $3.80 |
| INA141[3] | Precision, Low Noise, Pin Com. w/AD6212 | I | 10, 100 | 0.002 | 5 | 50 | 0.7 | 110 | 200 | 8 | ±2.25 to ±18[4] | 0.8 | SOIC-8 | $3.55 |
| INA118 | Precision, Low Drift | I | 1 to 10000 | 0.002 | 5 | 55 | 0.7 | 107 | 70 | 10 | ±1.35 to ±18[4] | 0.385 | SOIC-8 | $4.15 |
| INA128[3] | Precision, Low Noise, Low Drift[4] | I | 1 to 10000 | 0.002 | 5 | 60 | 0.7 | 120 | 200 | 8 | ±2.25 to ±18 | 0.8 | SOIC-8 | $3.05 |
| INA129 | Precision, Low Noise, Low Drift, AD620 Second Source[4] | I | 1 to 10000 | 0.002 | 5 | 60 | 0.7 | 120 | 200 | 8 | ±2.25 to ±18 | 0.8 | SOIC-8 | $3.05 |
| INA122 | μpower, RRO, CM to Ground | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 90 | 5 | 60 | ±1.3 to ±18 | 0.085 | SOIC-8 | $2.10 |
| INA125 | Internal Ref, Sleep Mode[4] | I | 4 to 10000 | 0.01 | 25 | 250 | 2 | 100 | 4.5 | 38 | ±1.35 to ±18 | 0.525 | SOIC-16 | $2.05 |
| INA126[3] | μpower, < 1V $V_{SAT}$, Low Cost | I | 5 to 10000 | 0.012 | 25 | 250 | 3 | 83 | 9 | 35 | ±1.35 to ±18 | 0.2 | SO/MSOP-8 | $1.05 |
| INA101 | Low Noise, Wide BW, Gain Sense Pins | C | 1 to 10000 | 0.007 | 30 | 259 | 23 | 100 | 25000 | 13 | ±5 to ±18 | 8.5 | TO-100, CDIP-14, PDIP-14, SO-16 | $7.90 |
| INA110 | Fast Settle, Low Noise, Low Bias, Wide BW | C | 1,10,100, 200, 500 | 0.01 | 0.05 | 280 | 2.5 | 106 | 470 | 10 | ±6 to ±18 | 4.5 | CDIP-16 | $7.00 |
| **Dual-Supply, Lowest Noise** | | | | | | | | | | | | | | |
| INA103 | Precision, Fast Settle, Low Drift, Audio, Mic Pre Amp, THD+N = 0.0009% | C | 1, 100 | 0.0006[5] | 12000 | 255 | 1.2[5] | 100 | 800 | 1 | ±9 to ±25 | 13 | SO-16 | $5.00 |
| INA163 | Precision, Fast Settle, Low Drift, Audio, Mic Pre Amp, THD+N = 0.002% | I | 1 to 10000 | 0.0006[5] | 12000 | 300 | 1.2[5] | 100 | 800 | 1 | ±4.5 to ±18 | 12 | SOIC-14 | $2.50 |
| INA166 | Precision, Fast Settle, Low Drift, Audio, Mic Pre Amp, THD+N = 0.09% | I | 2000 | 0.005 | 12000 | 300 | 2.5[5] | 100 | 450 | 1.3 | ±4.5 to ±18 | 12 | SO-14 Narrow | $5.95 |
| INA217 | Precision, Low Drift, Audio, Mic Pre Amp, THD+N = 0.09%, SSM2017 Replacement | I | 1 to 10000 | 0.0006[5] | 12000 | 300 | 1.2[5] | –100 | 800 | 1.3 | ±4.5 to ±18 | 12 | SO-16 | $2.50 |

[1] 推荐零售价为每1000片时的美元价格。 [2] I = -40°C至+85°C；C = 0°C至70°C。 [3] 此部分器件可提供双通道版本。 [4] 内置+40V输入保护。 [5] 典型值。

## 运算放大器选择指南

| Device | Description | Package Options | S, D, T, Q[2] | Offset (mV) (max) | Drift (μV/°C) (typ) | $I_B$ (pA) (max) | Noise 1kHz (nV/√Hz) | GBW (MHz) (typ) | SR (V/μs) (typ) | $V_{IN}$ Low (min) | $V_{IN}$ High (max) | $V_{OUT}$ Low | $V_{OUT}$ High | $V_{SUP}$ | $I_Q$ / Amp (mA) (max) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bipolar Input—Low Offset, Low Drift** | | | | | | | | | | | | | | | | |
| OPA228 | Very Low Noise, G>5 | SOIC | S, D, Q | 0.075 | 0.1 | 10nA | 3 | 33 | 10 | (V–) +2 | (V+) –2 | (V–) +2 | (V+) –2 | ±2.5 to ±18 | 3.8 | $1.10 |
| OPA227 | Very Low Noise Bipolar | SOIC | S, D, Q | 0.075 | 0.1 | 10nA | 3 | 8 | 2.3 | (V–) +2 | (V+) –2 | (V–) +2 | (V+) –2 | ±2.5 to ±18 | 3.8 | $1.65 |
| OPA277 | Lowest Offset/Drift | **QFN** | S, D, Q | 0.02 | 0.1 | 1nA | 8 | 1 | 0.8 | (V–) +2 | (V+) –2 | (V–) +0.5 | (V+) –1.2 | ±2 to ±18 | 0.825 | $0.85 |
| OPA234 | Single Supply, General Purpose | MSOP | S, D, Q | 0.1 | 0.5 | 25nA | 25 | 0.35 | 0.2 | (V–) –0.1 | (V+) –1 | (V–) +0.1 | (V+) –1 | 2.7 to 36 | 0.3 | $1.30 |
| TLV2451 | Good Speed/Power | SOT23 | S, D, Q | 1.5 | 0.3 | 5nA | 51 | 0.22 | 0.12 | (V–) | (V+) | (V–) +0.03 | (V+) –0.07 | 2.7 to 6.0 | 0.035 | $0.60 |
| OPA241 | Low Power, Single Supply | SOIC | S, D, Q | 0.25 | 0.4 | 20nA | 45 | 0.035 | 0.01 | (V–) –0.2 | (V+) –1 | (V–) +0.1 | (V+) –0.1 | 2.7 to 36 | 0.03 | $1.15 |
| **FET-Input—Low Noise, Wide Bandwidth** | | | | | | | | | | | | | | | | |
| OPA627 | DiFET, Lowest THD+N | SOIC | S | 0.5 | 2.5 | 10 | 5.6 | 16 | 55 | (V–) +4 | (V+) –4 | (V–) +3.5 | (V+) –3.5 | ±4.5 to ±18 | 7.5 | $12.25 |
| OPA134 | 0.00008% THD+N, Audio | SOIC | S, D, Q | 2 | 2 | 100 | 8 | 8 | 20 | (V–) +2.5 | (V+) –2.5 | (V–) +0.5 | (V+) –0.5 | ±2.5 to ±18 | 5 | $0.95 |
| OPA132 | 0.00008% THD+N, Precision | SOIC | S, D, Q | 0.5 | 2 | 50 | 8 | 8 | 20 | (V–) +2.5 | (V+) –2.5 | (V–) +0.5 | (V+) –0.5 | ±2.5 to ±18 | 4.8 | $1.45 |
| OPA137 | Lost Cost FET, SOT23 | SOIC | S, D, Q | 3 | 2.5 | 100 | 45 | 1 | 3.5 | (V–) +3 | (V+) | (V–) +0.5 | (V+) –1.2 | ±2.5 to ±18 | 0.27 | $0.60 |
| OPA130 | Low Power, FET | SOIC | S, D, Q | 1 | 2 | 20 | 16 | 1 | 2 | (V–) +2 | (V+) –2 | (V–) +1.2 | (V+) –1.5 | ±2.5 to ±18 | 0.65 | $1.40 |
| **CMOS—Low Input Bias Current ($I_B$), Rail-to-Rail In and Out** | | | | | | | | | | | | | | | | |
| OPA355 | High-Speed, RRO | SOT23 | S, D, T | 9 | 7 | 50 | 5.8 | 200 | 300 | (V–) –0.2 | (V+) –1 | (V–) –0.1 | (V+) –1.5 | 2.5 to 5.5 | 11 | $1.90 |
| **OPA365** | Outstanding ADC Driver Low THD+N | SOT23 | S, D, Q | 0.5 | 4 | 10 | 5 | 50 | 25 | (V–) –0.2 | (V+) +0.2 | (V–) +0.01 | (V+) –0.01 | 2.2 to 5.5 | 5 | — |
| OPA350 | Excellent ADC Driver Amp, Low Offset | MSOP | S, D, Q | 0.5 | 4 | 10 | 8 | 38 | 22 | (V–) –0.1 | (V+) +0.1 | (V–) +0.05 | (V+) –0.05 | 2.5 to 5.5 | 7.5 | $1.30 |
| OPA725/6 | Low-Noise, High-Speed | SOT23 | S,D | 3 | 4 | 200 | 15 | 20 | 30 | (V–) | (V+) –2.5 | (V–) +0.1 | (V+) –0.1 | 4 to 12 | 6.2 | $0.90 |
| **OPA727** | e-trim™, Low Offset,Drift | QFN | S | 0.15 | 0.3 | 100 | 6 | 20 | 30 | (V–) | (V+) –2.5 | (V–) +0.1 | (V+) –0.1 | 4 to 12 | 4.3 | $1.45 |
| TLC081 | Low Cost, Shutdown | MSOP | S, D, Q | 1.9 | 1.2 | 50 | 8.5 | 10 | 16 | (V–) | (V+) –1.5 | (V–) +0.25 | (V+) –0.9 | 4.5 to 16 | 2.5 | $0.50 |
| TLV2781 | 1.8V, 8MHz, Shutdown | SOT23 | S, D, Q | 3 | 8 | 15 | 18 | 8 | 4.3 | (V–) –0.2 | (V+) +0.2 | (V–) +0.07 | (V+) –0.02 | 1.8 to 3.6 | 0.82 | $0.65 |
| OPA743 | 12V, RRIO, SOT23 | SOT23 | S, D, Q | 1.5 | 8 | 10 | 30 | 7 | 10 | (V–) –0.1 | (V+) +0.1 | (V–) +0.075 | (V+) –0.075 | 3.5 to 12 | 1.5 | $0.95 |
| OPA364 | 1.8V, High CMRR, Low Offset | SOT23 | S, D, Q | 0.5 | 2 | 10 | 17 | 7 | 5 | (V–) –0.1 | (V+) +0.1 | (V–) +0.02 | (V+) –0.02 | 1.8 to 5.5 | 0.75 | $0.60 |
| OPA340 | Low Offset, Excellent Swing | SOT23 | S, D, Q | 0.5 | 2.5 | 10 | 25 | 5.5 | 6 | (V–) –0.3 | (V+) +0.3 | (V–) +0.005 | (V+) –0.005 | 2.5 to 5.5 | 0.95 | $0.80 |
| TLC2272 | Dual or Quad, RRIO | TSSOP | D, Q | 0.95 | 2 | 60 | 9 | 2.18 | 3.6 | (V–) | (V+) –1.5 | (V–) +0.15 | (V+) –0.01 | 4.4 to 16 | 1.5 | $0.65 |
| TLC220x | SS, Low Noise | SOIC | S, D | 0.2 | 0.5 | 10 | 8 | 1.8 | 2.5 | (V–) | (V+) –2.3 | (V–) +0.05 | (V+) –0.3 | 4.6 to 16 | 1.5 | $1.75 |
| OPA348 | Lowest Power 1MHz Amp | SC-70 | S, D, Q | 5 | 2 | 10 | 35 | 1 | 0.5 | (V–) –0.2 | (V+) +0.2 | (V–) +0.018 | (V+) –0.018 | 2.5 to 5.5 | 0.065 | $0.45 |
| OPA703/4 | RRIO, SOT23/G>5 | SOT23 | S, D, Q | 0.75 | 4 | 10 | 45 | 1 | 0.6 | (V–) –0.3 | (V+) +12.3 | (V–) +0.045 | (V+) –0.05 | 4 to 12 | 0.2 | $1.30 |
| TLV2761 | 1.8V μpower | SOT23 | S, D, Q | 3.5 | 9 | 15 | 95 | 0.5 | 0.2 | (V–) –0.2 | (V+) +0.2 | (V–) +0.01 | (V+) –0.01 | 1.8 to 3.6 | 0.028 | $0.65 |
| OPA347 | High Speed/Power, Dual in WCSP | **WCSP**, SC-70 | S, D, Q | 6 | 2 | 10 | 60 | 0.35 | 0.17 | (V–) –0.2 | (V+) +0.2 | (V–) +0.005 | (V+) –0.005 | 2.3 to 5.5 | 0.034 | $0.48 |
| TLC2252 | Dual or Quad, RRO, Low Power | TSSOP | D, Q | 1.5 | 0.5 | 60 | 19 | 0.2 | 0.12 | (V–) | (V+) –1 | (V–) +0.15 | (V+) –0.1 | 4.4 to 16 | 0.07 | $0.65 |
| OPA336 | μpower, Low Offset | SOT23 | S, D, Q | 0.125 | 1.5 | 10 | 40 | 0.1 | 0.03 | (V–) –0.2 | (V+) –1 | (V–) +0.1 | (V+) –0.1 | 2.3 to 5.5 | 0.032 | $0.40 |
| **OPA379** | μpower, Low Noise | SC-70 | S, D, Q | 1.5 | 2 | 25 | 80 | 0.09 | 0.015 | (V–) –0.2 | (V+) +0.2 | (V–) +0.01 | (V+) –0.01 | 1.8 to 5.5 | 0.005 | |
| OPA349 | Excellent Speed, Power, 1.8V | SC-70 | S, D, Q | 10 | 15 | 10 | 300 | 0.07 | 0.02 | (V–) –0.2 | (V+) +0.2 | (V–) +0.3 | (V+) –0.3 | 1.8 to 5.5 | 0.002 | $0.75 |
| TLV2401 | Ultra-Low Power | SOT23 | S, D, Q | 1.2 | 3 | 300 | 500 | 0.005 | 0.002 | (V–) –0.1 | (V+) +0.2 | (V–) +0.15 | (V+) –0.05 | 2.5 to 16 | 0.95μA | $0.80 |
| **Auto-Zero Autocalibration—Highest Precision, Lowest Drift** | | | | | | | | | | | | | | | | |
| **OPA380** | High Speed Trans. Amp | MSOP | S,D | 0.025 | 0.1 | 50 | 5.8 | 90 | 80 | (V–) | (V+) –1.8 | (V–) | (V+) –0.4 | 2.7 to 5.5 | 9.5 | $1.95 |
| **OPA381** | Low Power Precision TIA | QFN | S | 0.025 | 0.1 | 50 | 10 | 18 | 12 | (V–) | (V+) –1.8 | (V–) | (V+) –0.4 | 2.7 to 5.5 | 1 | $1.45 |
| TLC450x | SS, Auto Cal | SOIC | S, D | 0.08 | 1 | 500 | 12 | 4.7 | 2.5 | (V–) | (V+) –2.3 | (V–) +0.1 | (V+) –0.1 | 4.0 to 6.0 | 1.5 | $1.35 |
| OPA335 | 5V Auto-Zero | SOT23 | S, D | 0.005 | 0.02 | 200 | 1.4μVp-p | 2 | 1.6 | (V–) –0.1 | (V+) –1.5 | (V–) +0.015 | (V+) –0.015 | 2.7 to 5.5 | 0.3 | $1.00 |
| OPA734/5 | 12V Auto-Zero | SOT23 | S,D | 0.005 | 0.05 | 200 | 150 | 1.6 | 1.5 | (V–) –0.1 | (V+) –1.5 | (V–) +0.02 | (V+) –0.02 | 2.7 to 12 | 0.75 | $1.25 |
| **OPA333** | μpower Auto-Zero | SC-70 | S, D | 0.01 | 0.05 | 50 | 1μVp-p | 0.35 | 0.05 | (V–) –0.1 | (V+) +0.1 | (V–) +0.01 | (V+) –0.01 | 1.8 to 5.5 | 0.02 | — |

[1] 推荐零售价为每1000片时的美元价格。
[2] S = 单通道； D =双通道； T =三通道； Q =四通道。

新产品以**粗体红色**标明。 前瞻性产品以**粗体蓝色**标明。



## 放大器

### 比较器选择指南

| Device | Description | Ch. | $I_Q$ Per Ch. (mA), (max) | Output Current (mA) (min) | $t_{RESP}$ Low-to-High (µs) | $V_S$ (V) (min) | $V_S$ (V) (max) | $V_{OS}$ (25°C) (mV) (max) | Output type | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **High Speed** | | | | | | | | | | | |
| TLV3501 | Ultra High-Speed, Rail-Rail | 1, 2 | 5 | — | 0.0045 | 2.7 | 5.5 | 6.5 | Push-Pull | SOT23, SOIC | $1.50 |
| TL714 | High-Speed, 10mV (typ) Hysteresis | 1 | 12 | 16 | 0.006 | 4.75 | 5.25 | 10 | Push-Pull | PDIP, SOIC | $2.16 |
| TL3016 | High-Speed, Low Offset | 1 | 12.5 | — | 0.0078 | 5 | 10 | 3 | Open-Drain/Collector | SOIC, TSSOP | $0.95 |
| TL3116 | Ultra Fast, Low Power, Precision | 1 | 14.7 | — | 0.0099 | 5 | 10 | 3 | Open-Drain/Collector | SOIC, TSSOP | $0.95 |
| TL712 | Single, High-Speed | 1 | 20 | 16 | 0.025 | 4.75 | 5.25 | 5 | Push-Pull | PDIP, SOIC, SOP | $0.83 |
| **Low Power $I_Q$ <0.5mA** | | | | | | | | | | | |
| TLV370x | Nanopower, Push-Pull, RRIO | 1, 2, 4 | 0.0008 | — | 36 | 2.5 | 16 | 5 | Push-Pull | MSOP, PDIP, SOIC, SOT23, TSSOP | $0.60 |
| TLV349x | Low Voltage, Speed/Power | 1, 2 | 0.0012 | — | <0.1 | 1.8 | 5.5 | 15 | Push-Pull | SOT23, SOIC, TSSOP | $0.42 |
| **Combination Comparators and Op Amps** | | | | | | | | | | | |
| TLV230x | Sub-µpower, RRIO | 2 | 0.0017 | — | 55 | 2.5 | 16 | 5 | Open Drain/Collector | MSOP, PDIP, SOIC, TSSOP | $0.90 |
| TLV270x | Sub-µpower, RRIO | 2, 4 | 0.0019 | — | 36 | 2.5 | 16 | 5 | Push-Pull | MSOP, PDIP, SOIC, TSSOP | $0.90 |
| **Comparator with On-Chip Voltage Reference** | | | | | | | | | | | |
| TLV3011 | µpower Open-Drain with Built-in 1.242V Ref | 1 | 0.003 | 5 | 6 | 1.8 | 5.5 | 15 | Open Drain/Collector | SC70, SOT23 | $0.75 |
| TLV3012 | µpower Push-Pull with Built-in 1.242V Ref | 1 | 0.005 | 0.5 | 6 | 1.8 | 5.5 | 12 | Push-Pull | SC70, SOT23 | $0.75 |

[1] 推荐零售价为每1000片时的美元价格。

### 高速放大器选择指南

| Device | Ch. | SHDN | Supply Voltage (V) | $A_{CL}$ (min) | BW at $A_{CL}$ (MHz) (typ) | BW G = +2 (MHz) (typ) | GBW Product (MHz) (typ) | Slew Rate (V/µs) | Settling Time 0.1% (ns) (typ) | THD 2Vpp G = 1.1MHz (dB) (typ) | Differential Gain (%) | Differential Phase (°) | $V_N$ (nV/√Hz) (typ) | $V_{OS}$ (mV) (max) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fully Differential** | | | | | | | | | | | | | | | | |
| THS4130/31 | 1 | Y | 5, ±5, ±15 | 1 | 150 | 90 | 90 | 52 | 78 | –97 | — | — | 1.3 | 2 | SOIC, MSOP PowerPAD™ | $3.50 |
| THS4150/51 | 1 | Y | 5, ±5, ±15 | 1 | 150 | 81 | 100 | 650 | 53 | –84 | — | — | 7.6 | 7 | SOIC, MSOP PowerPAD, Leadless MSOP PowerPAD | $4.70 |
| THS4502/03 | 1 | Y | 5, ±5 | 1 | 370 | 175 | 300 | 2800 | 6.3 | –100 | — | — | 6 | 7 | SOIC, MSOP PowerPAD, Leadless MSOP PowerPAD | $4.00 |
| THS4504/05 | 1 | Y | 5, ±5 | 1 | 260 | 110 | 210 | 1800 | 20 | –100 | — | — | 8 | 7 | SOIC, MSOP PowerPAD, Leadless MSOP PowerPAD | $1.75 |
| **CMOS Amplifiers** | | | | | | | | | | | | | | | | |
| OPA354 | 1 | — | 2.5 to 5.5 | 1 | 250 | 90 | 100 | 150 | 30 | — | 0.02 | 0.09 | 6.5 | 8 | SOT23, SOIC PowerPAD | $0.75 |
| OPA2354 | 2 | — | 2.5 to 5.5 | 1 | 250 | 90 | 100 | 150 | 30 | — | 0.02 | 0.09 | 6.5 | 8 | SOIC PowerPAD, MSOP | $1.20 |
| OPA4354 | 4 | — | 2.5 to 5.5 | 1 | 250 | 90 | 100 | 150 | 30 | — | 0.02 | 0.09 | 6.5 | 8 | SOIC, TSSOP | $1.80 |
| OPA355 | 1 | Y | 2.5 to 5.5 | 1 | 450 | 100 | 200 | 300 | 30 | — | 0.02 | 0.05 | 5.8 | 9 | SOT23, SOIC | $0.90 |
| OPA2355 | 2 | Y | 2.5 to 5.5 | 1 | 450 | 100 | 200 | 300 | 30 | — | 0.02 | 0.05 | 5.8 | 9 | MSOP | $1.50 |
| OPA3355 | 3 | Y | 2.5 to 5.5 | 1 | 450 | 100 | 200 | 300 | 30 | — | 0.02 | 0.05 | 5.8 | 9 | SOIC | $1.90 |
| OPA356 | 1 | — | 2.5 to 5.5 | 1 | 450 | 100 | 200 | 300 | 30 | — | 0.02 | 0.05 | 5.8 | 9 | SOT23, SOIC | $0.90 |
| OPA2356 | 2 | — | 2.5 to 5.5 | 1 | 450 | 100 | 200 | 300 | 30 | — | 0.02 | 0.05 | 5.8 | 9 | SOIC, MSOP | $1.50 |
| OPA357 | 1 | Y | 2.5 to 5.5 | 1 | 250 | 90 | 100 | 150 | 30 | — | 0.02 | 0.09 | 6.5 | 8 | SOT23, SOIC PowerPAD | $0.75 |
| OPA2357 | 2 | Y | 2.5 to 5.5 | 1 | 250 | 90 | 100 | 150 | 30 | — | 0.02 | 0.09 | 6.5 | 8 | MSOP | $1.20 |
| OPA358 | 1 | Y | 2.7 to 3.3 | 1 | 75 | — | 80 | 55 | — | — | 0.3 | 0.7 | 5.8 | 6 | SC-70 | $0.45 |
| **FET-Input** | | | | | | | | | | | | | | | | |
| OPA656 | 1 | — | ±5 | 1 | 500 | 200 | 230 | 290 | — | –80 | 0.02 | 0.05 | 7 | 1.8 | SOT23, SOIC | $3.35 |
| OPA657 | 1 | — | ±5 | 7 | 350 | 300 | 1600 | 700 | 10 | –80 | — | — | 4.8 | 1.8 | SOT23, SOIC | $3.80 |
| THS4131 | 1 | N | 5, ±5, ±15 | 1 | 150 | 90 | 90 | 52 | 78 | –97 | — | — | 2 | | SOIC, MSOP PowerPAD | $3.50 |

[1] 推荐零售价为每1000片时的美元价格。

放大器 

## 高速放大器选择指南（续）

| Device | Ch. | SHDN | Supply Voltage (V) | $A_{CL}$ (min) | BW at $A_{CL}$ (MHz) (typ) | BW G = +2 (MHz) (typ) | GBW Product (MHz) (typ) | Slew Rate (V/µs) | Settling Time 0.1% (ns) (typ) | THD 2Vpp G = 1.1MHz (dB) (typ) | Differential Gain (%) | Differential Phase (°) | $V_N$ (nV/√Hz) (typ) | $V_{OS}$ (mV) (max) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Voltage Feedback** | | | | | | | | | | | | | | | | |
| OPA820 | 1, 2, 4 | N | 5, ±5 | 1 | 800 | 240 | 280 | 240 | 18 | –84 | 0.01 | 0.03 | 0.75 | 1 | SOP,SOIC | $0.90 |
| OPA842 | 1 | — | ±5 | 1 | 400 | 56 | 200 | 400 | 15 | — | 0.003 | 0.008 | 2.7 | 1.2 | SOT23, SO | $1.55 |
| OPA843 | 1 | — | ±5 | 3 | 500 | 65 | 800 | 1000 | 7.5 | — | 0.001 | 0.012 | 2 | 1.2 | SOT23, SO | $1.60 |
| OPA846 | 1, 2 | — | ±5 | 7 | 500 | — | 1750 | 625 | 15 | — | 0.02 | 0.02 | 1.2 | 0.5 | SOT23, SOIC | $1.70 |
| OPA847 | 1 | — | ±5 | 12 | 600 | — | 3900 | 950 | 20 | — | — | — | 0.85 | 0.5 | SOT23, SOIC | $2.00 |
| OPA2613 | 2 | N | 5, ±5 | 1 | 230 | 110 | 125 | 70 | 40 | –94 | — | — | 1 | 1 | SOIC | $1.55 |
| THS4031/32 | 1, 2 | — | ±5, ±15 | 2 | 100 | 100 | 200 | 100 | 60 | –72 | 0.015 | 0.025 | 1.6 | 2 | SOIC, MSOP PowerPAD™ | $2.00 |
| THS4011/12 | 1, 2 | N | ±5, ±15 | 1 | 290 | 50 | 100 | 310 | 37 | –80 | 0.006 | 0.01 | 6 | 6 | SOIC, MSOP PowerPAD | $2.30 |
| THS4051/52 | 1, 2 | N | ±5, ±15 | 1 | 70 | 38 | — | 240 | 60 | –82 | 0.01 | 0.01 | 10 | 10 | SOIC, MSOP PowerPAD | $1.10 |
| THS4081/82 | 1, 2 | N | ±5, ±15 | 1 | 175 | — | 100 | 230 | 43 | –64 | 0.01 | 0.05 | 7 | 4.5 | SOIC, MSOP PowerPAD | $1.80 |
| THS4271 | 1 | Y | 5, ±5, 15 | 1 | 1400 | 390 | 400 | 1000 | 25 | –110 | 0.007 | 0.004 | 3 | 10 | SOIC, MSOP PowerPAD | $2.85 |
| **Voltage-Limiting Amplifiers** | | | | | | | | | | | | | | | | |
| OPA698 | 1 | N | 5, ±5 | 1 | 450 | 215 | 250 | 1100 | — | –93 | 0.012 | 0.008 | 5.6 | 5 | SOIC | $2.00 |
| OPA699 | 1 | N | 5, ±5 | 4 | 260 | — | 1000 | 1400 | — | — | 0.012 | 0.008 | 4.1 | 5 | SOIC | $2.05 |
| **Current Feedback** | | | | | | | | | | | | | | | | |
| OPA691 | 1, 2, 3 | Y | 5, ±5 | 1 | 280 | 255 | — | 2100 | 8 | –93 | 0.07 | 0.02 | 1.7 | 2.5 | SOT23, SOIC | $1.55 |
| OPA695 | 1 | Y | 5, ±5 | 1 | 1700 | 1400 | — | 4300 | — | –86 | 0.04 | 0.007 | 3 | 3 | SOT23, SOIC | $1.35 |
| OPA684 | 1, 2, 3, 4 | Y | 5, ±5 | 1 | 210 | 160 | — | 820 | — | –77 | 0.04 | 0.02 | 3.7 | 0.35 | SOT23, SOIC | $1.35 |
| OPA683 | 1, 2 | Y | 5, ±5 | 1 | 200 | 150 | — | 540 | — | –84 | 0.06 | 0.03 | 4.4 | 3.5 | SOT23, SOIC | $1.20 |
| OPA694 | 1 | N | ±5 | 1 | 1500 | 690 | — | 1700 | 13 | — | 0.03 | 0.015 | 4.1 | 3 | SOT23, SOIC | $1.25 |
| THS3091/95 | 1, 2 | Y | ±5, ±15 | 1 | 235 | 210 | — | 5000 | 42 | –72 | 0.013 | 0.02 | 2 | 3 | SOIC, SOIC PowerPAD | $3.60 |
| THS3110/12 | 1, 2 | Y | ±5, ±15 | 1 | 100 | 90 | — | 1300 | 27 | –78 | 0.01 | 0.03 | 6 | 8 | SOIC, MSOP PowerPAD | $1.85 |
| THS3120/22 | 1, 2 | N | ±5, ±15 | 1 | 130 | — | — | 1500 | 11 | –53 | 0.007 | 0.018 | 2 | 8 | SOIC, MSOP PowerPAD | $2.25 |

[1] 推荐零售价为每1000片时的美元价格。

## 高速缓冲放大器选择指南

| Device | Spec[2] Temp Range | $V_S$ ±15 (V) | $V_S$ ±5 (V) | $V_S$ +5 (V) | $A_{CL}$ Min Stable Gain (V/V) | BW at ACL (MHz) | Slew Rate (V/µs) | Settling Time 0.01% (ns) (typ) | $I_Q$ (mA) (typ) | THD (FC = 1MHz) (dB) (typ) | Diff Gain (%) | Diff Phase (°) | $V_{OS}$ (mV) max | $I_B$ (µA) max | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BUF162 | I | N | ±5 | Yes | 1 | 1600 | 9000 | — | 5.8 | 80 | 0.06 | 0.02 | ±30 | ±7 | SOIC, MSOP, PowerPAD™ | $1.60 |
| BUF634 | I | Yes | Yes | Yes | 1 | 180 | 2000 | 200 | 250 | — | 0.4 | 0.1 | 100 | 20 | DIP, SOIC, TO220-5, DDPak-5 | $3.05 |
| OPA633 | C | Yes | Yes | — | 1 | 260 | 2500 | 50 | 100 | — | — | 0.1 | 15 | 35 | DIP | $5.45 |

[1] 推荐零售价为每1000片时的美元价格。 [2] I = -40°C至 +85°C； C = 0°C至70°C.如需完全的产品列表，敬请访问amplifier.ti.com。

## 脉宽调制(PWM)功率驱动器

| Device | Temp Range[2] | Output Current (A) (min) | Saturation Voltage (V) (max) | $I_Q$ (mA) (max) | $V_S$ (V) (min) | $V_S$ (V) (max) | Duty Cycle (%) (min) | Duty Cycle (%) (max) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| **Single Switch** | | | | | | | | | | |
| DRV101 | I | 1.9 | 1 | 5 | 9 | 60 | 10 | 90 | TO-220, DDPAK | $3.85 |
| DRV102 | WI | 2 | 2.2 | 9 | 8 | 60 | 10 | 90 | TO-220, DDPAK | $3.85 |
| DRV103 | I | 3 | 0.6 | 0.8 | 8 | 32 | 10 | 90 | SO-8, SO-8 PowerPAD™ | $1.60 |
| DRV104 | I | 1.2 | 0.65 | 1 | 8 | 32 | 10 | 90 | 14-lead PowerPAD | $1.60 |

[1] 推荐零售价为每1000片时的美元价格。 [2] I = -40°C至 +85°C； WI = -55°C至 +125°C.



## 放大器

### 功率运算放大器选择指南

| Device | Spec[2] Temp Range | $I_{OUT}$ (A) | $V_S$ (V) | Bandwidth (MHz) | Slew Rate (V/μs) | $I_Q$ (mA) (max) | $V_{OS}$ (mV) (max) | $V_O$ Drift (μV/°C) (max) | $I_B$ (nA) (max) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OPA445/B | I2 | 0.015 | 10 to 40 | 2 | 15 | 4.7 | 5-3 | 10 | 0.05 | TO-99, DIP-8, SO-8 | $4.75 |
| OPA452 | EI | 0.05 | 20 to 80 | 1.8 | 7.2 | 5.5 | 3 | 5 | 0.1 | TO220-7, DDPak-7 | $2.55 |
| OPA453 | EI | 0.05 | 20 to 80 | 7.5 | 23 | 5.5 | 3 | 5 | 0.1 | TO220-7, DDPak-7 | $2.55 |
| OPA541 | I2 | 10 | ±10 to ±40 | Full Power 55kHz | 10 | 20 | 1 | 30 | 0.05 | TO-3, ZIP | $11.10 |
| OPA544 | I | 2 | 20 to 70 | 1.4 | 8 | 12 | 5 | 10 | 0.1 | TO220-5, DDPak-5 | $6.88 |
| OPA2544 | I | 2 | 20 to 70 | 1.4 | 8 | 12 | 5 | 10 | 0.1 | ZIP11 | $12.00 |
| OPA547 | I | 0.5 | 8 to 60 | 1 | 6 | 10 | 5 | 25 | 500 | TO220-7, DDPak-7 | $4.35 |
| OPA548 | I | 3 | 8 to 60 | 1 | 10 | 17 | 10 | 30 | 500 | TO220-7, DDPak-7 | $6.00 |
| OPA549 | I | 8 | 8 to 60 | 0.9 | 9 | 26 | 5 | 20 | 500 | ZIP11 | $12.00 |
| OPA551 | EI | 0.2 | 8 to 60 | 3 | 15 | 7 | 3 | 7 | 0.1 | DIP-8, SO-8, DDPak-7 | $2.40 |
| OPA552 | EI | 0.2 | 8 to 60 | 12 | 24 | 7 | 3 | 7 | 0.1 | DIP-8, SO-8, DDPak-7 | $1.75 |
| OPA561 | EI | 1.2 | 7 to 16 | 17 | 50 | 50 | 20 | 50 | 0.1 | HTSSOP-20 | $2.65 |
| OPA569 | I | 2 | 2.7 to 5.5 | 1.2 | 1.2 | 6 | 2 | 1.3 (typ) | 10μA | SO-20 PowerPAD™ | $3.10 |
| TLV411x | EI | 0.3 | 2.5 to 6 | 2.7 | 1.6 | 1 | 3.5 | 3 | 0.05 | PDIP, MSOP, SOIC | $0.75 |

[1] 推荐零售价为每1000片时的美元价格。 [2] I2 = -25°C至 +85°C； I = -40°C至 +85°C； EI = –40°C至+125°C。

### 数字温度传感器选择指南

| Device | Supply Voltage (V) | Interface | –25 to 85°C Accuracy (°C max)[2] | Quiescent Current (μA) max | Resolution (Bits) | Programmable Temp Alert | Max Operating Temp (°C) | Package | Price[1] |
|---|---|---|---|---|---|---|---|---|---|
| TMP100 | 2.7 to 5.5 | 2-Wire | ±2 | 45 | 9 to 12 | — | 150 | SOT23 | $0.75 |
| TMP101 | 2.7 to 5.5 | 2-Wire | ±2 | 45 | 9 to 12 | ✓ | 150 | SOT23 | $0.80 |
| TMP175 | 2.7 to 5.5 | 2-Wire | ±1.5 | 50 | 12 | ✓ | 127 | SO-8 | $0.85 |
| TMP75 | 2.7 to 5.5 | 2-Wire | ±1.5 | 50 | 12 | ✓ | 127 | SO-8 | $0.70 |
| TMP121 | 2.7 to 5.5 | SPI | ±1.5 | 50 | 12 | — | 150 | SOT23 | $0.90 |
| TMP122 | 2.7 to 5.5 | SPI | ±1.5 | 50 | 9 to 12 | ✓ | 150 | SOT23 | $0.99 |
| TMP123 | 2.7 to 5.5 | SPI | ±1.5 | 50 | 12 | — | 150 | SOT23 | $0.90 |
| TMP124 | 2.7 to 5.5 | SPI | ±1.5 | 50 | 12 | — | 150 | SO-8 | $0.70 |
| TMP125 | 2.7 to 5.5 | SPI | ±2.0 | 50 | 10 | — | 125 | SOT23-6 | $0.80 |
| TMP141 | 2.7 to 5.5 | SensorPath | ±2 | 170 | 10 | — | 127 | SOT23 | $0.65 |
| **TMP300** | 1.8 to 18 | Analog and Comparator Outputs | ±2 | 100 | — | Resistor Prog. with 5°C/10°C Hysteresis | 150 | SC-70 | $0.70 |
| **TMP301** | 1.8 to 18 | Comparator Output | ±2 | 50 | — | Resistor Prog. with 5°C/10°C Hysteresis | 150 | SC-70 | $0.70 |

[1] 推荐零售价为每1000片时的美元价格。 [2] 所列数字温度传感器典型精度为±0.5°C。

前瞻性产品以**粗体蓝色**标明。



## 4-20mA发射机及接收机选择指南

| Device | Description | Sensor Excitation | Loop Voltage (V) | Full-Scale Input Range | Output Range (mA) | Additional Power Available (V at mA) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|
| **2-Wire General Purpose** | | | | | | | | |
| XTR101 | $I_A$ with Current Excitation | Two 1mA | 11.6 to 40 | 5mV to 1V | 4-20mA | — | DIP-14, SOIC-16 | $8.70 |
| XTR115 | $I_{IN}$ to $I_{OUT}$ Converter, External Resistor Scales $V_{IN}$ to $I_{IN}$ | $V_{REF}$ = 2.5V | 7.5 to 36 | 40µA to 200µA | 4-20mA | — | SOIC-8 | $1.05 |
| XTR116 | $I_{IN}$ to $I_{OUT}$ Converter, External Resistor Scales $V_{IN}$ to $I_{IN}$ | $V_{REF}$ = 4.096V | 7.5 to 36 | 40µA to 200µA | 4-20mA | — | SOIC-8 | $1.05 |
| **XTR117** | $I_{IN}$ to $I_{OUT}$ Converter, External Resistor Scales $V_{IN}$ to $I_{IN}$ | $V_{REF}$ = 5.0V | 7.5 to 36 | 40µA to 200µA | 4-20mA | — | MSOP-8, DFN 8 | $0.90 |
| **3-Wire General Purpose** | | | | | | | | |
| XTR110 | Selectable Input/Output Ranges | $V_{REF}$ = 10V | 13.5 to 40 | 0V to 5V, 0V to 10V | 4-20mA, 0-20mA, 0-25mA | — | DIP-16, SOIC-16 | $7.10 |
| **4-20mA Current Loop Receiver** | | | | | | | | |
| RCV420 | 4-20mA Input, 0V to 5V Output | $V_{REF}$ = 10V | ±40V | 4-20mA | 0V to 5V | — | DIP-16 | $3.55 |
| **2-Wire RTD Conditioner with Linearization** | | | | | | | | |
| XTR105 | 100Ω RTD Conditioner | Two 800µA | 7.5 to 36 | 5mV to 1V | 4-20mA | 5.1 at 1 | DIP-14, SOIC-14 | $4.00 |
| XTR112 | High-Resistance RTD Conditioner | Two 250µA | 7.5 to 36 | 5mV to 1V | 4-20mA | 5.1 at 1 | SOIC-14 | $4.00 |
| XTR114 | High-Resistance RTD Conditioner | Two 100µA | 7.5 to 36 | 5mV to 1V | 4-20mA | 5.1 at 1 | SOIC-14 | $4.00 |
| **2-Wire Bridge Sensor Conditioner with Linearization** | | | | | | | | |
| XTR106 | Bridge Conditioner | 5V and 2.5V | 7.5 to 36 | 5mV to 1V | 4-20mA | 5.1 at 1 | DIP-14, SOIC-14 | $4.00 |
| **2-Wire RTD Conditioner with Digital Calibration for Linearization, Span and Offset** | | | | | | | | |
| XTR108 | 100Ω to 1kΩ RTD Conditioner, 6-Channel Input Mux, Extra Op Amp Can Convert to Voltage Sensor Excitation, Calibration Stored in External EEPROM | Two 500µA | 7.5 to 24 | 5mV to 320mV | 4-20mA | 5.1 at 2.1 | SSOP-24 | $3.35 |
| **Bridge Conditioner with Digital Calibration for Linearization, Span and Offset Over Temperature** | | | | | | | | |
| PGA309 | Complete Digitally Calibrated Bridge Sensor Conditioner, Voltage Output, Calibration Stored in External EEPROM, One-Wire/Two-Wire Interface | $V_{EXC}$ = $V_S$, 2.5V, 4.096V | N/A | 1mV/V to 245mV/V | 0.1V to 4.9V at $V_S$=+5V | — | TSSOP-16 | $3.40 |
| **XTR300** | Output Driver for Industrial and Process Control Loops User Selects V or I | — | ±17.5V | ±17V | ±17.5V, ±20mA | — | 5 x 5 QFN | — |

[1] 推荐零售价为每1000片时的美元价格。

新产品以**粗体红色**标明。 前瞻性产品以**粗体蓝色**标明。

## 电压基准选择指南

| Device | Description | Output (V) | Initial Accuracy (%) max | Drift (ppm/°C) max | Long-Term Stability (ppm/1000hr) (typ) | Noise 0.1 to 10Hz (µVp-p) (typ) | $I_Q$ max (mA) | Temperature Range (°C) | Output Current (mA) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| REF32xx | Precision, µpower | 1.25, 2.048, 2.5 3.0, 3.3, 4.096 | 0.2 | 7 | 55 | 17 to 53 | 0.12 | –40 to +125 | ±10 | SOT23-6 | $1.70 |
| REF31xx | Precision, µpower | 1.25, 2.048, 2.5 3.0, 3.3, 4.096 | 0.2 | 15 | 24 | 15 to 30 | 0.1 | –40 to +125 | ±10 | SOT23-3 | $1.10 |
| REF30xx | µpower, Bandgap | 1.25, 2.048, 2.5, 3.0, 3.3, 4.096 | 0.2 | 50 | 24 | 20 to 45 | 0.05 | –40 to +125 | 25 | SOT23-3 | $0.60 |
| REF02B | Low Drift, Low Noise, Buried Zener | 5 | 0.13 | 10 | 50 | 4 | 1.4 | –25 to +85 | +21, –0.5 | PDIP-8, SOIC-8 | $2.65 |
| REF102A | Low Drift, Low Noise, Buried Zener | 10 | 0.1 | 10 | 20 | 5 | 1.4 | –25 to +85 | +10, –5 | PDIP-8, SOIC-8 | $1.75 |
| REF102B | Low Drift, Low Noise, Buried Zener | 10 | 0.05 | 5 | 20 | 5 | 1.4 | –25 to +85 | +10, –5 | PDIP-8, SOIC-8 | $4.40 |
| REF1112 | Nanopower 1.25V Shunt | 1.25 | 0.2 | 30 | 60 | 25 | 0.0012 | –40 to +125 | 1A to 5mA | SOT-23 | $0.85 |
| REF102C | Ultra-Low Drift, Low Noise, Buried Zener | 10 | 0.025 | 2.5 | 20 | 5 | 1.4 | –25 to +85 | +10, –5 | PDIP-8, SOIC-8 | $5.10 |
| **Current References** | | | | | | | | | | | |
| REF200 | Dual Current Reference with Current Mirror | Two 100µA | ±1µA | 25 (typ) | — | 1µAp-p | — | –25 to +85 | 50µA to 400µA3 | PDIP-8, SOIC-8 | $2.60 |

[1] 推荐零售价为每1000片时的美元价格。



## 数据转换器

### ΔΣADC选择指南

| Device | Res. (Bits) | Sample Rate (kSPS) | Number of Input Channels | Interface | Input Voltage (V) | $V_{REF}$ | Linearity (%) | NMC (Bits) | Power (mW) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ADS1258** | 24 | 125 | 16 SE/8 Diff | Serial, SPI | ±5 | Ext | 0.001 | 24 | 44 | QFN-48 | $8.95 |
| **ADS1271** | 24 | 105 | 1 Diff | Serial, SPI | ±2.5 | Ext | 0.0015 | 24 | 35-100 | TSSOP-16 | $5.90 |
| ADS1252 | 24 | 41 | 1 SE/1 Diff | Serial | ±5 | Ext | 0.0015 | 24 | 40 | SOIC-8 | $5.60 |
| **ADS1255** | 24 | 30 | 2 SE/1 Diff | Serial, SPI | PGA (1-64), ±5V | Ext | 0.001 | 24 | 35 | SSOP-20 | $8.25 |
| **ADS1256** | 24 | 30 | 8 SE/4 Diff | Serial, SPI | PGA (1-64), ±5V | Ext | 0.001 | 24 | 35 | SSOP-28 | $8.95 |
| ADS1251 | 24 | 20 | 1 SE/1 Diff | Serial | ±5 | Ext | 0.0015 | 24 | 7.5 | SOIC-8 | $5.60 |
| ADS1253 | 24 | 20 | 4 SE/4 Diff | Serial | ±5 | Ext | 0.0015 | 24 | 7.5 | SSOP-16 | $6.70 |
| ADS1254 | 24 | 20 | 4 SE/4 Diff | Serial | ±5 | Ext | 0.0015 | 24 | 4 | SSOP-20 | $6.70 |
| ADS1210/11 | 24 | 16 | 1/4 SE/1/4 Diff | Serial, SPI | PGA (1-16), ±5 | Int/Ext | 0.0015 | 24 | 27.5 | PDIP-18/24, SOIC-18/24, SSOP-28 | $10.25/ $10.90 |
| ADS1216 | 24 | 0.78 | 8 SE/4 Diff | Serial, SPI | PGA (1-128), ±2.5 | Int/Ext | 0.0015 | 24 | 0.6 | TQFP-48 | $5.00 |
| ADS1217 | 24 | 0.78 | 8 SE/4 Diff | Serial, SPI | PGA (1-128), ±5 | Int/Ext | 0.0012 | 24 | 0.8 | TQFP-48 | $5.00 |
| ADS1218 | 24 | 0.78 | 8 SE/4 Diff | Serial, SPI | PGA (1-128), ±2.5 | Int/Ext | 0.0015 | 24 | 0.8 | TQFP-48 | $5.50 |
| **ADS1222** | 24 | 0.24 | 2 SE/2 Diff | Serial | ±5 | Ext | 0.0015 | 24 | 0.5 | TSSOP-14 | $2.95 |
| **ADS1224** | 24 | 0.24 | 4 SE/4 Diff | Serial | ±5 | Ext | 0.0015 | 24 | 0.5 | TSSOP-20 | $3.25 |
| **ADS1232** | 24 | 0.8 | 2 SE/2 Diff | Serial | PGA (1-128), ±2.5 | Ext | 0.0015 | 24 | 3 | TSSOP-24 | $3.90 |
| **ADS1234** | 24 | 0.8 | 4 SE/4 Diff | Serial | PGA (1-128), ±2.5 | Ext | 0.0015 | 24 | 3 | TSSOP-28 | $4.50 |
| ADS1244 | 24 | 0.015 | 1 SE/1 Diff | Serial | ±5 | Ext | 0.0008 | 24 | 0.3 | MSOP-10 | $2.95 |
| ADS1245 | 24 | 0.015 | 1 SE/1 Diff | Serial | ±2.5 | Ext | 0.0015 | 24 | 0.5 | MSOP-10 | $3.10 |
| ADS1240 | 24 | 0.015 | 4 SE/2 Diff | Serial, SPI | PGA (1-128), ±2.5 | Ext | 0.0015 | 24 | 0.6 | SSOP-24 | $3.80 |
| ADS1241 | 24 | 0.015 | 8 SE/4 Diff | Serial, SPI | PGA (1-128), ±2.5 | Ext | 0.0015 | 24 | 0.5 | SSOP-28 | $4.20 |
| ADS1242 | 24 | 0.015 | 4 SE/2 Diff | Serial, SPI | PGA (1-128), ±2.5 | Ext | 0.0015 | 24 | 0.6 | TSSOP-16 | $3.60 |
| ADS1243 | 24 | 0.015 | 8 SE/4 Diff | Serial, SPI | PGA (1-128), ±2.5 | Ext | 0.0015 | 24 | 0.6 | TSSOP-20 | $3.95 |
| ADS1212/13 | 22 | 6.25 | 1/4 SE/1/4 Diff | Serial, SPI | PGA (1-16), ±5 | Int/Ext | 0.0015 | 22 | 1.4 | PDIP-18/24, SOIC-18/24, SSOP-28 | $7.70/ $9.00 |
| ADS1250 | 20 | 25 | 1 SE/1 Diff | Serial, SPI | PGA (1-8), ±4 | Ext | 0.003 | 20 | 75 | SOIC-16 | $6.95 |
| ADS1100 | 16 | 0.128 | 1 SE/1 Diff | Serial, $I^2C$ | PGA (1-8), $V_{DD}$ | Ext | 0.0125 | 16 | 0.3 | SOT23-6 | $1.80 |
| ADS1110 | 16 | 0.24 | 1 SE/1 Diff | Serial, $I^2C$ | PGA (1-8), ±2.048 | Int | 0.01 | 16 | 0.7 | SOT23-6 | $1.95 |
| ADS1112 | 16 | 0.24 | 3 SE/2 Diff | Serial, $I^2C$ | PGA (1-8), ±2.048 | Int | 0.01 | 16 | 0.7 | MSOP-10, SON-10 | $2.65 |
| TLC7135 | 14 | 3 | 1 SE/1 Diff | MUX BCD | $\pm V_{REF}$ | Ext | 0.005 | 4.5 Dig | 5 | PDIP-28, SOIC-28 | $1.95 |
| **ADS1000** | 12 | 0.128 | 1 SE/1 Diff | Serial, $I^2C$ | PGA(1-8), $V_{DD}$ | Ext | 0.0125 | 12 | 0.3 | SOT23-6 | $0.99 |
| **ADS1010** | 12 | 0.25 | 1 SE/1 Diff | Serial, $I^2C$ | PGA(1-8), ±2.048 | Int | 0.01 | 12 | 0.7 | SOT23-6 | $1.10 |
| **ADS1012** | 12 | 0.24 | 3 SE/1 Diff | Serial, $I^2C$ | PGA(1-8), ±2.048 | Int | 0.01 | 12 | 0.7 | MSOP-10, SON-10 | $1.45 |
| **Delta-Sigma (ΔΣ) ADCs for Measuring Low-Level Currents (Photodiodes)** | | | | | | | | | | | |
| DDC101 | 20 | 10 | 1 | Serial | 500pC | Ext | 0.025 | 20 | 170 | SOIC-24 | $23.00 |
| DDC112 | 20 | 3 | 2 | Serial | 50-1000pC | Ext | 0.025 | 20 | 80 | SOIC-28, TQFP-32 | $12.10 |
| **DDC114** | 20 | 3 | 4 | Serial | 12-350pC | Ext | 0.025 | 20 | 55 | QFN-48 | $18.00 |
| **DDC118** | 20 | 3 | 8 | Serial | 12-350pC | Ext | 0.025 | 20 | 110 | QFN-48 | $32.00 |

[1]推荐零售价为每1000片时的美元价格。

新产品以**粗体红色**标明。 前瞻性产品以**粗体蓝色**标明。

### 大带宽ΔΣ ADC选择指南

| Device | (Bits) | Sample Rate (kSPS) | Bandwidth (kHz) | Number of Input Channels | Interface | Input Voltage (V) | SNR (dB) | THD (dB) | Power (mW) | Package | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ADS1271** | 24 | 105 | 51 | 1 Diff | Serial | ±2.5 | 109 | –105 | 35-100 | TSSOP-16 | $5.90 |
| ADS1625 | 18 | 1.25MSPS | 615 | 1 Diff | P18 | ±3.75 | 93 | –103 | 520 | TQFP-64 | $37.60 |
| ADS1626 | 18 | 1.25MSPS | 615 | 1 Diff | P18 w/FIFO | ±3.75 | 93 | –103 | 520 | TQFP-64 | $39.60 |
| **ADS1610** | 16 | 10MSPS | 4900 | 1 Diff | P16 | ±3 | 84 | –96 | 1000 | TQFP-64 | — |
| ADS1605 | 16 | 5MSPS | 2450 | 1 Diff | P16 | ±3.75 | 88 | –101 | 570 | TQFP-64 | $32.05 |
| ADS1606 | 16 | 5MSPS | 2450 | 1 Diff | P16 w/FIFO | ±3.75 | 88 | –101 | 570 | TQFP-64 | $33.75 |
| **ADS1602** | 16 | 2.5MSPS | 1230 | 1 Diff | Serial | ±3 | 91 | –103 | 550 | TQFP-48 | $23.00 |
| **ADS1601** | 16 | 1.25MSPS | 615 | 1 Diff | Serial | ±3 | 92 | –105 | 350 | TQFP-48 | $14.00 |

[1]推荐零售价为每1000片时的美元价格。

新产品以**粗体红色**标明。 前瞻性产品以**粗体蓝色**标明。

## SAR ADCs选择指南

| Device | Res. (Bits) | Sample Rate (kSPS) | Number of Input Channels | Interface | Input Voltage (V) | $V_{REF}$ | Linearity (%) | NMC | SINAD (dB) | Power (mW) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ADS8380** | 18 | 600 | 1 SE, 1 PDiff | Serial, SPI | $V_{REF}$ | Int/Ext | 0.0015 | 18 | 91 | 115 | 6 X 6 QFN-28 | $16.50 |
| **ADS8382** | 18 | 600 | 1 Diff | Serial, SPI | $\pm V_{REF}$ (4.2V) at $V_{REF}/2$ | Int/Ext | 0.0012 | 18 | 96 | 115 | 6 X 6 QFN-28 | $16.95 |
| ADS8381 | 18 | 580 | 1 SE, 1 PDiff | P8/P16/P18 | $V_{REF}$ | Ext | 0.0015 | 16 | 93 | 115 | TQFP-48 | $16.65 |
| ADS8383 | 18 | 500 | 1 SE, 1 PDiff | P8/P16/P18 | $V_{REF}$ | Ext | 0.0026 | 18 | 85 | 110 | TQFP-48 | $15.75 |
| ADS8411 | 16 | 2000 | 1 SE, 1 PDiff | P8/P16 | $V_{REF}$ | Int | 0.0038 | 16 | 87 | 155 | TQFP-48 | $22.00 |
| ADS8412 | 16 | 2000 | 1 Diff | P8/P16 | $\pm V_{REF}$ (4.2V) at $V_{REF}/2$ | Int | 0.0038 | 16 | 90 | 155 | TQFP-48 | $23.05 |
| ADS8401 | 16 | 1250 | 1 SE, 1 PDiff | P8/P16 | $V_{REF}$ | Int | 0.0053 | 16 | 85 | 155 | TQFP-48 | $12.55 |
| ADS8402 | 16 | 1250 | 1 Diff | P8/P16 | $\pm V_{REF}$ (4.2V) at $V_{REF}/2$ | Int | 0.0053 | 16 | 88 | 155 | TQFP-48 | $13.15 |
| **ADS8405** | 16 | 1250 | 1 SE, 1 PDiff | P8/P16 | $V_{REF}$ | Int/Ext | 0.003 | 16 | 85 | 155 | TQFP-48 | $14.10 |
| **ADS8406** | 16 | 1250 | 1 Diff | P8/P16 | $\pm V_{REF}$ (4.2V) at $V_{REF}/2$ | Int/Ext | 0.003 | 16 | 90 | 155 | TQFP-48 | $14.70 |
| ADS8371 | 16 | 750 | 1 SE, 1 PDiff | P8/P16 | $V_{REF}$ | Ext | 0.0023 | 16 | 87 | 130 | TQFP-48 | $12.00 |
| **ADS8370** | 16 | 600 | 1 SE, 1 PDiff | Serial, SPI | $V_{REF}$ | Int/Ext | 0.0015 | 16 | 90 | 110 | 6 X 6 QFN-28 | $12.50 |
| **ADS8372** | 16 | 600 | 1 Diff | Serial, SPI | $\pm V_{REF}$ (4.2V) at $V_{REF}/2$ | Int/Ext | 0.0012 | 16 | 94 | 110 | 6 X 6 QFN-28 | $13.00 |
| ADS8322 | 16 | 500 | 1 PDiff | P8/P16 | 5 | Int/Ext | 0.009 | 15 | 83 | 85 | TQFP-32 | $7.10 |
| ADS8323 | 16 | 500 | 1 Diff | P8/P16 | ±2.5V at 2.5 | Int/Ext | 0.009 | 15 | 83 | 85 | TQFP-32 | $7.10 |
| ADS8361 | 16 | 500 | 2 x 2 Diff | Serial, SPI | ±2.5V at +2.5 | Int/Ext | 0.00375 | 14 | 83 | 150 | SSOP-24 | $10.35 |
| **ADS8509** | 16 | 250 | 1 SE | Serial, SPI | +4, 5, 10; ±3.3, 5, 10 | Int/Ext | 0.003 | 16 | 86 | 70 | SOIC-20, SSOP-28 | $12.95 |
| **ADS8505** | 16 | 250 | 1 SE | P16 | ±10 | Int/Ext | 0.0045 | 16 | 86 | 70 | SOIC-28, SSOP-28 | $12.95 |
| ADS8342 | 16 | 250 | SE | P8/P16 | ±2.5 | Ext | 0.006 | 16 | 85 | 200 | TQFP-48 | $11.30 |
| ADS7811 | 16 | 250 | 1 SE | P16 | ±2.5 | Int/Ext | 0.006 | 15 | 87 | 200 | SOIC-28 | $36.15 |
| ADS7815 | 16 | 250 | 1 SE | P16 | ±2.5 | Int/Ext | 0.006 | 15 | 84 | 200 | SOIC-28 | $21.30 |
| ADS8364 | 16 | 250 | 1 x 6 Diff | P16 | ±2.5V at +2.5 | Int/Ext | 0.0045 | 14 | 82.5 | 413 | TQFP-64 | $18.10 |
| TLC4541 | 16 | 200 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.0038 | 16 | 84.5 | 17.5 | SOIC-8, VSSOP-8 | $6.85 |
| TLC4545 | 16 | 200 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.0038 | 16 | 84.5 | 17.5 | SOIC-8, VSSOP-8 | $6.85 |
| ADS7805 | 16 | 100 | 1 SE | P8/P16 | ±10 | Int/Ext | 0.0045 | 16 | 86 | 81.5 | PDIP-28, SOIC-28 | $21.80 |
| ADS7809 | 16 | 100 | 1 SE | Serial, SPI | +4, 10, ±3.3, 5, 10 | Int/Ext | 0.0045 | 16 | 88 | 81.5 | SOIC-20 | $21.80 |
| ADS8320 | 16 | 100 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.012 | 15 | 84 | 1.95 | VSSOP-8 | $5.15 |
| ADS8321 | 16 | 100 | 1 Diff | Serial, SPI | $\pm V_{REF}$ at $+V_{REF}$ | Ext | 0.012 | 15 | 84 | 5.5 | VSSOP-8 | $5.15 |
| ADS8325 | 16 | 100 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.006 | 16 | 91 | 2.25 | VSSOP-8, QFN-8 | $5.90 |
| ADS8341 | 16 | 100 | 4 SE/2 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.006 | 15 | 86 | 3.6 | SSOP-16 | $7.40 |
| ADS8343 | 16 | 100 | 4 SE/2 Diff | Serial, SPI | $\pm V_{REF}$ at $V_{REF}$ | Ext | 0.006 | 15 | 86 | 3.6 | SSOP-16 | $7.45 |
| ADS8344 | 16 | 100 | 8 SE/4 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.006 | 15 | 86 | 3.6 | SSOP-20 | $8.00 |
| ADS8345 | 16 | 100 | 8 SE/4 Diff | Serial, SPI | $\pm V_{REF}$ at $V_{REF}$ | Ext | 0.006 | 15 | 85 | 3.6 | SSOP-20 | $8.00 |
| ADS7807 | 16 | 40 | 1 SE | Serial, SPI/P8 | 4, 5, ±10 | Int/Ext | 0.0022 | 16 | 88 | 28 | PDIP-28, SOIC-28 | $27.40 |
| ADS7813 | 16 | 40 | 1 SE | Serial, SPI | +4, 10, ±3.3, 5, 10 | Int/Ext | 0.003 | 16 | 89 | 35 | PDIP-16, SOIC-16 | $21.30 |
| ADS7825 | 16 | 40 | 4 SE | Serial, SPI/P8 | ±10 | Int/Ext | 0.003 | 16 | 83 | 50 | PDIP-28, SOIC-28 | $29.55 |
| ADS7891 | 14 | 3000 | 1 SE | P8/P14 | 2.5 | Int | 0.009 | 14 | 78 | 90 | TQFP-48 | $10.50 |
| ADS7890 | 14 | 1250 | 1 SE | Serial, SPI | 2.5 | Int | 0.009 | 14 | 78 | 90 | TQFP-48 | $10.50 |
| TLC3541 | 14 | 200 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.006 | 14 | 81.5 | 17.5 | SOIC-8, VSSOP-8 | $5.00 |
| TLC3544 | 14 | 200 | 4 SE/2 Diff | Serial, SPI | 4 | Int/Ext | 0.006 | 14 | 81 | 20 | SOIC-20, TSSOP-20 | $6.00 |
| TLC3545 | 14 | 200 | 1 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.006 | 14 | 81.5 | 17.5 | SOIC-8, VSSOP-8 | $5.00 |
| TLC3548 | 14 | 200 | 8 SE/4 Diff | Serial, SPI | 4 | Int/Ext | 0.006 | 14 | 81 | 20 | SOIC-24, TSSOP-24 | $6.40 |
| TLC3574 | 14 | 200 | 4 SE | Serial, SPI | ±10 | Ext | 0.006 | 14 | 79 | 29 | SOIC-24, TSSOP-24 | $6.85 |
| TLC3578 | 14 | 200 | 8 SE | Serial, SPI | ±10 | Ext | 0.006 | 14 | 79 | 29 | SOIC-24, TSSOP-24 | $8.65 |
| ADS8324 | 14 | 50 | 1 Diff | Serial, SPI | $\pm V_{REF}$ at $+V_{REF}$ | Ext | 0.012 | 14 | 78 | 2.5 | VSSOP-8 | $4.15 |
| ADS7871 | 14 | 40 | 8 SE/4 Diff | Serial, SPI | PGA (1, 2, 4, 8, 10, 16, 20) | Int | 0.03 | 13 | — | 6 | SSOP-28 | $5.00 |
| ADS7881 | 12 | 4000 | 1 SE | P8/P12 | 2.5 | Int | 0.024 | 12 | 71.5 | 110 | TQFP-48 | $7.35 |
| **ADS7869** | 12 | 1000 | 12 Diff | Serial, SPI/P12 | ±2.5 at +2.5 | Int/Ext | 0.048 | 11 | — | 175 | TQFP-100 | $14.60 |
| **ADS7886** | 12 | 1000 | 1 SE, 1 PDiff | Serial, SPI | $V_{DD}$ (2.35V to 5.25V) | Ext ($V_{DD}$) | 0.036 | 12 | 70 | 17.5 | SOT23-6, SC-70 | $2.25 |
| ADS7810 | 12 | 800 | 1 SE | P12 | ±10 | Int/Ext | 0.018 | 12 | 71 | 225 | SOIC-28 | $27.80 |
| ADS7818 | 12 | 500 | 1 PDiff | Serial, SPI | 5 | Int | 0.024 | 12 | 70 | 11 | PDIP-8, VSSOP-8 | $2.50 |

[1] *推荐零售价为每1000片时的美元价格。*

*新产品以**粗体红色**标明。 前瞻性产品以**粗体蓝色**标明。*



## 数据转换器

### SAR ADCs选择指南（续）

| Device | Res. (Bits) | Sample Rate (kSPS) | Number of Input Channels | Interface | Input Voltage (V) | $V_{REF}$ | Linearity (%) | NMC | SINAD (dB) | Power (mW) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADS7834 | 12 | 500 | 1 PDiff | Serial, SPI | 2.5 | Int | 0.024 | 12 | 70 | 11 | VSSOP-8 | $2.45 |
| ADS7835 | 12 | 500 | 1 Diff | Serial, SPI | ±2.5 | Int | 0.024 | 12 | 72 | 17.5 | VSSOP-8 | $2.75 |
| ADS7852 | 12 | 500 | 8 SE | P12 | 5 | Int/Ext | 0.024 | 12 | 72 | 13 | TQFP-32 | $3.40 |
| ADS7861 | 12 | 500 | 2 x 2 Diff | Serial, SPI | ±2.5 at +2.5 | Int/Ext | 0.024 | 12 | 70 | 25 | SSOP-24 | $4.05 |
| ADS7862 | 12 | 500 | 2 x 2 Diff | P12 | ±2.5 at +2.5 | Int/Ext | 0.024 | 12 | 71 | 25 | TQFP-32 | $5.70 |
| ADS7864 | 12 | 500 | 3 x 2 Diff | P12 | ±2.5 at +2.5 | Int/Ext | 0.024 | 12 | 71 | 52.5 | TQFP-48 | $6.65 |
| TLC2551 | 12 | 400 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | 72 | 15 | SOIC-8, VSSOP-8 | $3.95 |
| TLC2552 | 12 | 400 | 2 SE | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | 72 | 15 | SOIC-8, VSSOP-8 | $3.95 |
| TLC2554 | 12 | 400 | 4 SE | Serial, SPI | 4 | Int/Ext | 0.024 | 12 | 71 | 9.5 | SOIC-16, TSSOP-16 | $5.30 |
| TLC2555 | 12 | 400 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | 72 | 15 | SOIC-8, VSSOP-8 | $3.95 |
| TLC2558 | 12 | 400 | 8 SE | Serial, SPI | 4 | Int/Ext | 0.024 | 12 | 71 | 9.5 | SOIC-20, TSSOP-20 | $5.30 |
| ADS7800 | 12 | 333 | 1 SE | P8/P12 | ±5, 10 | Int | 0.012 | 12 | 72 | 135 | CDIP SB-24, PDIP-24 | $30.50 |
| **ADS8508** | 12 | 250 | 1 SE | Serial, SPI | +4, 10, ±3.3, 5, 10 | Int/Ext | 0.011 | 12 | 73 | 70 | SSOP-28, SOIC-20 | $8.90 |
| **ADS8504** | 12 | 250 | 1 SE | P8/P16 | ±10 | Int/Ext | 0.011 | 12 | 72 | 70 | SSOP-28, SOIC-28 | $8.90 |
| **ADS7866** | 12 | 200 | 1 SE/1 PDiff | Serial, SPI | $V_{DD}$ (1.2V to 3.6V) | Ext | 0.024 | 12 | 70 | 0.25 | SOT23-6 | $2.15 |
| ADS7816 | 12 | 200 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | 72 | 1.9 | PDIP-8, SOIC-8, VSSOP-8 | $1.95 |
| ADS7817 | 12 | 200 | 1 Diff | Serial, SPI | $\pm V_{REF}$ at $+V_{REF}$ | Ext | 0.024 | 12 | 71 | 2.3 | SOIC-8, VSSOP-8 | $1.95 |
| ADS7841 | 12 | 200 | 4 SE/2 Diff | Serial, SPI | $V_{REF}$, $\pm V_{REF}$ at $V_{REF}$ | Ext | 0.024 | 12 | 72 | 0.84 | SSOP-16 | $2.50 |
| ADS7842 | 12 | 200 | 4 SE | P12 | $V_{REF}$ | Ext | 0.024 | 12 | 72 | 0.84 | SSOP-28 | $3.10 |
| ADS7844 | 12 | 200 | 8 SE/4 Diff | Serial, SPI | $V_{REF}$, $\pm V_{REF}$ at $V_{REF}$ | Ext | 0.024 | 12 | 72 | 0.84 | SSOP-20 | $2.90 |
| TLC2574 | 12 | 200 | 4 SE | Serial, SPI | ±10 | Ext | 0.024 | 12 | 79 | 29 | SOIC-20, TSSOP-20 | $5.30 |
| TLC2578 | 12 | 200 | 8 SE | Serial, SPI | ±10 | Ext | 0.024 | 12 | 79 | 29 | SOIC-24, TSSOP-24 | $5.80 |
| TLV2541 | 12 | 200 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | 72 | 2.8 | SOIC-8, VSSOP-8 | $3.85 |
| TLV2542 | 12 | 200 | 2 SE | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | 72 | 2.8 | SOIC-8, VSSOP-8 | $3.85 |
| TLV2544 | 12 | 200 | 4 SE | Serial, SPI | +2, 4 | Int/Ext | 0.024 | 12 | 70 | 3.3 | SOIC-16, TSSOP-16 | $4.20 |
| TLV2545 | 12 | 200 | 1 PDiff | Serial, SPI | +5.5 ($V_{REF} = V_{DD}$) | Ext | 0.024 | 12 | 72 | 2.8 | SOIC-8, VSSOP-8 | $3.85 |
| TLV2548 | 12 | 200 | 8 SE | Serial, SPI | +2, 4 | Int/Ext | 0.024 | 12 | 70 | 3.3 | SOIC-20, TSSOP-20 | $4.85 |
| TLV2553 | 12 | 200 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | — | 2.43 | SOIC-20, TSSOP-20 | $3.40 |
| TLV2556 | 12 | 200 | 11 SE | Serial, SPI | $V_{REF}$ | Int/Ext | 0.024 | 12 | — | 2.43 | SOIC-20, TSSOP-20 | $3.55 |
| **ADS7829** | 12 | 125 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.018 | 12 | 71 | 0.6 | QFN-8 | $1.50 |
| **AMC7823** | 12 | 200 | 8 SE I/O DAS | Serial, SPI | 5 | Int/Ext | 0.024 | 12 | 74 | 100 | QFN-40 | $9.75 |
| AMC7820 | 12 | 100 | 8 DAS | Serial, SPI | 5 | Int | 0.024 | 12 | 72 (typ) | 40 | TQFP-48 | $3.75 |
| ADS7804 | 12 | 100 | 1 SE | P8/P16 | ±10 | Int/Ext | 0.011 | 12 | 72 | 81.5 | PDIP-28, SOIC-28 | $14.05 |
| ADS7808 | 12 | 100 | 1 SE | Serial, SPI | +4, 10 , ±3.3, 5, 10 | Int/Ext | 0.011 | 12 | 73 | 81.5 | SOIC-20 | $10.85 |
| ADS7822 | 12 | 75 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.018 | 12 | 71 | 0.6 | PDIP-8, SOIC-8, VSSOP-8, | $1.55 |
| TLC2543 | 12 | 66 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | — | 5 | CDIP-20, PDIP-20, PLCC-20, SOIC-20, SSOP-20 | $4.45 |
| TLV2543 | 12 | 66 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | — | 3.3 | PDIP-20, SOIC-20, SSOP-20 | $4.45 |
| ADS7823 | 12 | 50 | 1 SE | Serial, $I^2C$ | $V_{REF}$ | Ext | 0.024 | 12 | 71 | 0.75 | VSSOP-8 | $2.85 |
| ADS7828 | 12 | 50 | 8 SE/4 Diff | Serial, $I^2C$ | $V_{REF}$ | Int/Ext | 0.024 | 12 | 71 | 0.675 | TSSOP-16 | $3.35 |
| ADS7870 | 12 | 50 | 8 SE | Serial, SPI | PGA(1, 2, 4, 8, 10, 16, 20) | Int | 0.06 | 12 | 72 | 4.6 | SSOP-28 | $4.15 |
| ADS7806 | 12 | 40 | 1 SE | Serial, SPI/P8 | +4, 5, ±10 | Int/Ext | 0.011 | 12 | 73 | 28 | PDIP-28, SOIC-28 | $12.75 |
| ADS7812 | 12 | 40 | 1 SE | Serial, SPI | +4, 10, ±3.3, 5, 10 | Int/Ext | 0.012 | 12 | 74 | 35 | PDIP-16, SOIC-16 | $11.80 |
| ADS7824 | 12 | 40 | 4 SE | Serial, SPI/P8 | ±10 | Int/Ext | 0.012 | 12 | 73 | 50 | PDIP-28, SOIC-28 | $13.10 |
| ADS1286 | 12 | 37 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.024 | 12 | 72 | 1 | PDIP-8, SOIC-8 | $2.80 |
| TLV1570 | 10 | 1250 | 8 SE | Serial, SPI | 2V, $V_{REF}$ | Int/Ext | 0.1 | 10 | 60 | 9 | SOIC-20, TSSOP-20 | $3.80 |
| TLV1571 | 10 | 1250 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | 60 | 12 | SOIC-24, TSSOP-24 | $3.70 |

[1] 推荐零售价为每1000片时的美元价格。

新产品以**粗体红色**标明。



## SAR ADCs选择指南（续）

| Device | Res. (Bits) | Sample Rate (kSPS) | Number of Input Channels | Interface | Input Voltage (V) | $V_{REF}$ | Linearity (%) | NMC | SINAD (dB) | Power (mW) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TLV1572 | 10 | 1250 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | 60 | 8.1 | SOIC-8 | $3.30 |
| TLV1578 | 10 | 1250 | 8 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | 60 | 12 | TSSOP-32 | $3.85 |
| **ADS7887** | 10 | 1000 | 1 SE, 1 PDiff | Serial, SPI | $V_{DD}$ (2.35V to 5.25V) | Ext ($V_{DD}$) | 0.073 | 10 | 61 | 17.5 | SOT23-6, SC-70 | $1.65 |
| TLC1514 | 10 | 400 | 4 SE/3 Diff | Serial, SPI | +5.5 ($V_{REF}$ = $V_{DD}$) | Int/Ext | 0.012 | 10 | 60 | 10 | SOIC-16, TSSOP-16 | $2.90 |
| TLC1518 | 10 | 400 | 8 SE/7 Diff | Serial, SPI | +5.5 ($V_{REF}$ = $V_{DD}$) | Int/Ext | 0.012 | 10 | 60 | 10 | SOIC-20, TSSOP-20 | $3.45 |
| **ADS7867** | 10 | 200 | 1 SE, 1 PDiff | Serial, SPI | $V_{DD}$ (1.2V to 3.6V) | Ext | 0.05 | 10 | 61 | 0.25 | SOT23-6 | $1.55 |
| **ADS7826** | 10 | 200 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.0048 | 10 | 62 | 0.6 | QFN-8 | $1.25 |
| TLV1504 | 10 | 200 | 4 SE | Serial, SPI | +2, 4 | Int/Ext | 0.05 | 10 | 60 | 3.3 | SOIC-16, TSSOP-16 | $2.65 |
| TLV1508 | 10 | 200 | 8 SE | Serial, SPI | +2, 4 | Int/Ext | 0.05 | 10 | 60 | 3.3 | SOIC-20, TSSOP-20 | $3.15 |
| TLC1550 | 10 | 164 | 1 SE | P10 | $V_{REF}$ | Ext | 0.05 | 10 | — | 10 | PLCC-28, SOIC-24 | $3.90 |
| TLC1551 | 10 | 164 | 1 SE | P10 | $V_{REF}$ | Ext | 0.1 | 10 | — | 10 | PLCC-28, SOIC-24 | $3.35 |
| TLV1544 | 10 | 85 | 4 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | — | 1.05 | SOIC-16, TSSOP-16 | $1.95 |
| TLV1548 | 10 | 85 | 8 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | — | 1.05 | CDIP-20, LCCC-20, SSOP-20 | $2.30 |
| TLC1542 | 10 | 38 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.05 | 10 | — | 4 | CDIP-20, LCCC-20, PDIP-20, PLCC-20, SOIC-20 | $2.50 |
| TLC1543 | 10 | 38 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | — | 4 | PLCC-20, SOIC-20, SSOP-20 | $1.90 |
| TLC1549 | 10 | 38 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | — | 4 | PDIP-8, SOIC-8 | $1.71 |
| TLV1543 | 10 | 38 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | — | 2.64 | CDIP-20, LCCC-20, PDIP-20, PLCC-20, SOIC-20, SSOP-20 | $2.15 |
| TLV1549 | 10 | 38 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | — | 1.32 | PDIP-8, SOIC-8 | $1.85 |
| TLC1541 | 10 | 32 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.1 | 10 | — | 6 | PDIP-20, PLCC-20, SOIC-20 | $3.20 |
| TLV571 | 8 | 1250 | 1 SE | P8 | $V_{REF}$ | Ext | 0.5 | 8 | 49 | 12 | SOIC-24, TSSOP-24 | $2.35 |
| **ADS7888** | 8 | 1000 | 1 SE, 1 PDiff | Serial, SPI | $V_{DD}$ (2.35V to 5.25V) | Ext ($V_{DD}$) | 0.2 | 8 | 49 | 17.5 | SOT23-6, SC-70 | $1.25 |
| TLC0820A | 8 | 392 | 1 SE | P8 | $V_{REF}$ | Ext | 0.2 | 8 | — | 37.5 | PLCC-20, SOIC-20, SSOP-20 | $1.90 |
| **ADS7827** | 8 | 250 | 1 PDiff | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | 48 | 0.6 | QFN-8 | $1.00 |
| **ADS7868** | 8 | 200 | 1 SE, 1 PDiff | Serial, SPI | $V_{DD}$ (1.2V to 3.6V) | Ext | 0.1 | 8 | 50 | 0.25 | SOT23-6 | $1.35 |
| TLC545 | 8 | 76 | 19 SE | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 6 | PDIP-28, PLCC-28 | $3.10 |
| ADS7830 | 8 | 75 | 8 SE/4 Diff | Serial, $I^2C$ | $V_{REF}$ | Int/Ext | 0.19 | 8 | 50 | 0.675 | TSSOP-16 | $1.40 |
| TLV0831 | 8 | 49 | 1 SE | Serial, SPI | +3.6 ($V_{REF}$ = $V_{DD}$) | Ext | 0.2 | 8 | — | 0.66 | PDIP-8, SOIC-8 | $1.40 |
| TLC548 | 8 | 45.5 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 9 | PDIP-8, SOIC-8 | $1.20 |
| TLV0832 | 8 | 44.7 | 2 SE/1 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 5 | PDIP-8, SOIC-8 | $1.40 |
| TLV0834 | 8 | 41 | 4 SE/2 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 0.66 | PDIP-14, SOIC-14, TSSOP-14 | $1.45 |
| TLC541 | 8 | 40 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 6 | PDIP-20, PLCC-20, SOIC-20 | $1.50 |
| TLC549 | 8 | 40 | 1 SE | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 9 | PDIP-8, SOIC-8 | $0.95 |
| TLV0838 | 8 | 37.9 | 8 SE/4 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 0.66 | PDIP-20, SOIC-20, TSSOP-20 | $1.45 |
| TLC0831 | 8 | 31 | 1 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 3 | PDIP-8, SOIC-8 | $1.40 |
| TLC542 | 8 | 25 | 11 SE | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 6 | PDIP-20, PLCC-20, SOIC-20 | $1.50 |
| TLC0832 | 8 | 22 | 2 SE/1 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 12.5 | PDIP-8, SOIC-8 | $1.40 |
| TLC0834 | 8 | 20 | 4 SE/2 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 3 | PDIP-14, SOIC-14 | $1.45 |
| TLC0838 | 8 | 20 | 8 SE/4 Diff | Serial, SPI | $V_{REF}$ | Ext | 0.2 | 8 | — | 3 | PDIP-20, SOIC-20, TSSOP-20 | $1.45 |

[1] *推荐零售价为每1000片时的美元价格。*

*新产品以**粗体红色**标明。*



## 数据转换器

### 基于8051核心的智能ΔΣ ADCs选择指南

| Device | ADC Res. (Bits) | Sample Rate (kSPS) | Number of Input Channels | Input Voltage (V) | $V_{REF}$ | CPU Core | Program Memory (kB) | Program Memory Type | SRAM (kB) | Power (mW/V) | DAC Output (Bits) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MSC1200Y3** | 24 | 1 | 8 Diff/8 SE | PGA (1-128), ± 2.5 | Int | 8051 | 8 | Flash | 0.1 | 3/2.7-5.25 | 8-Bit IDAC | $6.45 |
| **MSC1201Y3** | 24 | 1 | 6 Diff/6 SE | PGA (1-128), ± 2.5 | Int | 8051 | 8 | Flash | 0.1 | 3/2.7-5.25 | 8-Bit IDAC | $5.95 |
| MSC1210Y5 | 24 | 1 | 8 Diff/8 SE | PGA (1-128), ± 2.5 | Int | 8051 | 32 | Flash | 1.2 | 4/2.7-5.25 | 16-Bit PWM | $12.00 |
| MSC1211Y2 | 24 | 1 | 8 Diff/8 SE | PGA (1-128), ± 2.5 | Int | 8051 | 4 | Flash | 1.2 | 4/2.7-5.25 | 4 x 16-Bit I/VDAC | $17.50 |
| MSC1211Y5 | 24 | 1 | 8 Diff/8 SE | PGA (1-128), ± 2.5 | Int | 8051 | 32 | Flash | 1.2 | 4/2.7-5.25 | 4 x 16-Bit I/VDAC | $20.95 |
| **MSC1213Y2** | 24 | 1 | 8 Diff/8 SE | PGA (1-128), ± 2.5 | Int | 8051 | 4 | Flash | 1.2 | 4/2.7-5.25 | 2 x 16-Bit I/VDAC | $12.65 |
| **MSC1213Y5** | 24 | 1 | 8 Diff/8 SE | PGA (1-128), ± 2.5 | Int | 8051 | 32 | Flash | 1.2 | 4/2.7-5.25 | 2 x 16-Bit I/VDAC | $15.95 |
| **MSC1202Y3** | 16 | 2 | 6 Diff/6 SE | PGA (1-128), ± 2.5 | Int | 8051 | 8 | Flash | 0.2 | 3/2.7-5.25 | 8-Bit IDAC | $4.95 |

[1] 推荐零售价为每1000片时的美元价格。

新产品以**粗体红色**标明。 前瞻性产品以**粗体蓝色**标明。

### ΔΣ DACs选择指南

| Device | Res. (Bits) | Settling Time (ms) | Number of Output DACs | Interface | Output (V) | $V_{REF}$ | Linearity (%) | Monotonic (Bits) | Power (mW) | Package | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DAC1220 | 20 | 10 | 1 | Serial, SPI | 5 | Ext | 0.0015 | 20 | 2.5 | SSOP-16 | $6.65 |
| DAC1221 | 16 | 2 | 1 | Serial, SPI | 2.5 | Ext | 0.0015 | 16 | 1.2 | SSOP-16 | $5.25 |

[1] 推荐零售价为每1000片时的美元价格。

### 串式及R-2R型 DACs选择指南

| Device | Architecture | Res. (Bits) | Settling Time (μs) | Number of Output DACs | Interface | Output (V) | $V_{REF}$ | Linearity (%) | Monotonic (Bits) | Power (mW) (typ) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAC7654 | R-2R | 16 | 12 | 4 | Serial, SPI | ±2.5 | Int | 0.0015 | 16 | 18 | LQFP-64 | $21.80 |
| DAC7664 | R-2R | 16 | 12 | 4 | P16 | ±2.5 | Int | 0.0015 | 16 | 18 | LQFP-64 | $20.75 |
| DAC7634 | R-2R | 16 | 10 | 4 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 15 | 7.5 | SSOP-48 | $19.95 |
| DAC7641 | R-2R | 16 | 10 | 1 | P16 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 15 | 1.8 | TQFP-32 | $6.30 |
| DAC7642 | R-2R | 16 | 10 | 2 | P16 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 15 | 2.5 | LQFP-32 | $10.55 |
| DAC7643 | R-2R | 16 | 10 | 2 | P16 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 15 | 2.5 | LQFP-32 | $10.55 |
| DAC7644 | R-2R | 16 | 10 | 4 | P16 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 15 | 7.5 | SSOP-48 | $19.95 |
| DAC7734 | R-2R | 16 | 10 | 4 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 16 | 50 | SSOP-48 | $31.45 |
| DAC712 | R-2R | 16 | 10 | 1 | P16 | ±10 | Int | 0.003 | 15 | 525 | SOIC-28 | $14.50 |
| DAC714 | R-2R | 16 | 10 | 1 | Serial, SPI | ±10 | Int | 0.0015 | 16 | 525 | SOIC-16 | $14.50 |
| DAC715 | R-2R | 16 | 10 | 1 | P16 | +10 | Int | 0.003 | 16 | 525 | SOIC-28 | $15.85 |
| DAC716 | R-2R | 16 | 10 | 1 | Serial, SPI | +10 | Int | 0.003 | 16 | 525 | SOIC-16 | $15.85 |
| DAC7631 | R-2R | 16 | 10 | 1 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 15 | 1.8 | SSOP-20 | $5.85 |
| DAC7632 | R-2R | 16 | 10 | 2 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 15 | 2.5 | LQFP-32 | $10.45 |
| DAC7744 | R-2R | 16 | 10 | 4 | P16 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.0015 | 16 | 50 | SSOP-48 | $31.45 |
| DAC8501 | String | 16 | 10 | 1 | Serial, SPI | $V_{REF}$ /MDAC | Ext | 0.0987 | 16 | 0.72 | VSSOP-8 | $3.00 |
| DAC8531 | String | 16 | 10 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.0987 | 16 | 0.72 | VSSOP-8, QFN 3 x 3 | $3.00 |
| DAC8532 | String | 16 | 10 | 2 | Serial, SPI | $+V_{REF}$ | Ext | 0.0987 | 16 | 1.35 | VSSOP-8 | $5.35 |
| DAC8544 | String | 16 | 8 | 4 | Parallel | $+V_{REF}$ | Ext | 0.025 | 16 | 4.75 | QFN 5 x 5 | $9.75 |
| DAC8534 | String | 16 | 10 | 4 | Serial, SPI | $+V_{REF}$ | Ext | 0.0987 | 16 | 2.7 | TSSOP-16 | $9.75 |
| DAC8541 | String | 16 | 10 | 1 | P16 | $+V_{REF}$ | Ext | 0.096 | 16 | 0.72 | TQFP-32 | $3.00 |
| **DAC8554** | String | 16 | 10 | 4 | Serial, SPI | $+V_{REF}$ | ext | 0.0122 | 16 | 1 | MSOP-8, SON-8 | $3.45 |
| DAC8571 | String | 16 | 10 | 1 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.0987 | 16 | 0.42 | MSOP-8 | $2.95 |
| DAC8574 | String | 16 | 10 | 4 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.0987 | 16 | 2.7 | TSSOP-16 | $10.25 |
| DAC7731 | R-2R | 16 | 5 | 1 | Serial, SPI | +10, ±10 | Int/Ext | 0.0015 | 16 | 100 | SSOP-24 | $8.20 |
| DAC7742 | R-2R | 16 | 5 | 1 | P16 | +10, ±10 | Int/Ext | 0.0015 | 16 | 100 | LQFP-48 | $8.70 |
| DAC7741 | R-2R | 16 | 5 | 1 | P16 | +10, ±10 | Int/Ext | 0.0015 | 16 | 100 | LQFP-48 | $8.30 |

[1] 推荐零售价为每1000片时的美元价格。

新产品以**粗体红色**标明。



## 串式及R-2R型 DACs选择指南（续）

| Device | Architecture | Res. (Bits) | Settling Time (µs) | Number of Output DACs | Interface | Output (V) | $V_{REF}$ | Linearity (%) | Monotonic (Bits) | Power (mW) (typ) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DAC8811** | R-2R | 16 | 0.5 | 1 | Serial, SPI | $\pm V_{REF}$/MDAC | Ext | 0.0015 | 16 | 0.025 | MSOP-8, SON-8 | $8.50 |
| **DAC8814** | R-2R | 16 | 1.0 | 4 | Serial, SPI | $\pm V_{REF}$/MDAC | Ext | 0.0015 | 16 | 0.0275 | SSOP-28 | $19.27 |
| **DAC8830** | R-2R | 16 | 1.0 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.0015 | 16 | 0.015 | SOIC-8 | $7.95 |
| **DAC8831** | R-2R | 16 | 1.0 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.0015 | 16 | 0.015 | SOIC-14 | $7.95 |
| **DAC8803** | R-2R | 14 | 1.0 | 4 | Serial, SPI | $\pm V_{REF}$/MDAC | Ext | 0.0061 | 14 | 0.0275 | SSOP-28 | $14.40 |
| **DAC8801** | R-2R | 14 | 0.5 | 1 | Serial, SPI | $\pm V_{REF}$/MDAC | Ext | 0.0061 | 14 | 0.025 | MSOP-8, SON-8 | $5.50 |
| DAC7512 | String | 12 | 10 | 1 | Serial, SPI | $V_{CC}$ | Ext | 0.38 | 12 | 0.7 | VSSOP-8, SOT23-6 | $1.45 |
| DAC7513 | String | 12 | 10 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.38 | 12 | 0.5 | VSSOP-8, SSOP-8 | $1.45 |
| DAC7571 | String | 12 | 10 | 1 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.096 | 12 | 0.7 | SOP-6, SOT23-6 | $1.55 |
| DAC7573 | String | 12 | 10 | 4 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.096 | 12 | 3 | TSSOP-16 | $6.15 |
| DAC7574 | String | 12 | 10 | 4 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.096 | 12 | 3 | MSOP-10 | $6.15 |
| DAC7611 | R-2R | 12 | 7 | 1 | Serial, SPI | 4.096 | Int | 0.012 | 12 | 2.5 | PDIP-8, SOIC-8 | $2.55 |
| DAC7612 | R-2R | 12 | 7 | 2 | Serial, SPI | 4.096 | Int | 0.012 | 12 | 3.75 | SOIC-8 | $2.70 |
| DAC7613 | R-2R | 12 | 10 | 1 | P12 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 1.8 | SSOP-24 | $2.50 |
| DAC7614 | R-2R | 12 | 10 | 4 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 20 | PDIP-16, SOIC-16, SSOP-20 | $6.70 |
| DAC7615 | R-2R | 12 | 10 | 4 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 20 | PDIP-16, SOIC-16, SSOP-20 | $6.70 |
| DAC7616 | R-2R | 12 | 10 | 4 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 3 | SOIC-16, SSOP-20 | $5.40 |
| DAC7617 | R-2R | 12 | 10 | 4 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 3 | SOIC-16, SSOP-20 | $5.40 |
| DAC7621 | R-2R | 12 | 7 | 1 | P12 | 4.096 | Int | 0.012 | 12 | 2.5 | SSOP-20 | $2.75 |
| DAC7624 | R-2R | 12 | 10 | 4 | P12 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 20 | PDIP-28, SOIC-28 | $10.25 |
| DAC7625 | R-2R | 12 | 10 | 4 | P12 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 20 | PDIP-28, SOIC-28 | $10.25 |
| DAC7714 | R-2R | 12 | 10 | 4 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 45 | SOIC-16 | $11.45 |
| DAC7715 | R-2R | 12 | 10 | 4 | Serial, SPI | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 45 | SOIC-16 | $11.45 |
| DAC7724 | R-2R | 12 | 10 | 4 | P12 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 45 | PLCC-28, SOIC-28 | $11.85 |
| DAC7725 | R-2R | 12 | 10 | 4 | P12 | $+V_{REF}$, $\pm V_{REF}$ | Ext | 0.012 | 12 | 45 | PLCC-28, SOIC-28 | $11.85 |
| **DAC7551** | String | 12 | 5 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.012 | 12 | 0.27 | SON-12 | $1.40 |
| **DAC7552** | String | 12 | 5 | 2 | Serial, SPI | $+V_{REF}$ | Ext | 0.024 | 12 | 0.675 | QFN-16 | $2.35 |
| **DAC7553** | String | 12 | 5 | 2 | Serial, SPI | $+V_{REF}$ | Ext | 0.024 | 12 | 0.675 | QFN-16 | $2.35 |
| **DAC7554** | String | 12 | 5 | 4 | Serial, SPI | $+V_{REF}$ | Ext | 0.0244 | 12 | 3.5 | MSOP-10 | $5.60 |
| **DAC7558** | String | 12 | 5 | 8 | Serial, SPI | $+V_{REF}$ | Ext | 0.012 | 12 | 4.5 | QFN-32 | $10.40 |
| DAC811 | R-2R | 12 | 4 | 1 | P12 | +10, ±5, 10 | Int | 0.006 | 12 | 625 | CDIP SB-28, PDIP-28, SOIC-28 | $11.00 |
| DAC813 | R-2R | 12 | 4 | 1 | P12 | +10, ±5, 10 | Int/Ext | 0.006 | 12 | 270 | PDIP-28, SOIC-28 | $12.60 |
| TLV5614 | String | 12 | 3 | 4 | Serial, SPI | $+V_{REF}$ | Ext | 0.1 | 12 | 3.6 | SOIC-16, TSSOP-16 | $7.45 |
| TLV5616 | String | 12 | 3 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.1 | 12 | 0.9 | VSSOP-8, PDIP-8, SOIC-8 | $2.60 |
| TLV5618A | String | 12 | 2.5 | 2 | Serial, SPI | $+V_{REF}$ | Ext | 0.08 | 12 | 1.8 | CDIP-8, PDIP-8, SOIC-8, LCCC-20 | $4.75 |
| DAC7545 | R-2R | 12 | 2 | 1 | P12 | $\pm V_{REF}$/MDAC | Ext | 0.012 | 12 | 30 | SOIC-20 | $5.25 |
| DAC7541 | R-2R | 12 | 1 | 1 | P12 | $\pm V_{REF}$/MDAC | Ext | 0.012 | 12 | 30 | PDIP-18, SOP-18 | $6.70 |
| DAC8043 | R-2R | 12 | 1 | 1 | Serial, SPI | $\pm V_{REF}$/MDAC | Ext | 0.012 | 12 | 2.5 | SOIC-8 | $5.25 |
| TLV5610 | String | 12 | 1 | 8 | Serial, SPI | $+V_{REF}$ | Ext | 0.4 | 12 | 18 | SOIC-20, TSSOP-20 | $8.50 |
| TLV5613 | String | 12 | 1 | 1 | P8 | $+V_{REF}$ | Ext | 0.1 | 12 | 1.2 | SOIC-20, TSSOP-20 | $2.60 |
| TLV5619 | String | 12 | 1 | 1 | P12 | $+V_{REF}$ | Ext | 0.08 | 12 | 4.3 | SOIC-20, TSSOP-20 | $2.60 |
| TLV5630 | String | 12 | 1 | 8 | Serial, SPI | $+V_{REF}$ | Int/Ext | 0.4 | 12 | 18 | SOIC-20, TSSOP-20 | $8.85 |
| TLV5633 | String | 12 | 1 | 1 | P8 | +2, 4 | Int/Ext | 0.08 | 12 | 2.7 | SOIC-20, TSSOP-20 | $4.70 |
| TLV5636 | String | 12 | 1 | 1 | Serial, SPI | +2, 4 | Int/Ext | 0.1 | 12 | 4.5 | SOIC-8, VSSOP-8 | $3.65 |
| TLV5638 | String | 12 | 1 | 2 | Serial, SPI | +2, 4 | Int/Ext | 0.1 | 12 | 4.5 | SOIC-8, CDIP-8, LCCC-20 | $3.25 |

[1] 推荐零售价为每1000片时的美元价格。

新产品以**粗体红色**标明。



## 数据转换器

### 串式及R-2R型 DACs选择指南（续）

| Device | Architecture | Res. (Bits) | Settling Time (µs) | Number of Output DACs | Interface | Output (V) | $V_{REF}$ | Linearity (%) | Monotonic (Bits) | Power (mW) (typ) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TLV5639 | String | 12 | 1 | 1 | P12 | +2, 4 | Int/Ext | 0.1 | 12 | 2.7 | SOIC-20, TSSOP-20 | $3.45 |
| DAC7800 | R-2R | 12 | 0.8 | 2 | Serial, SPI | 1mA | Ext | 0.012 | 12 | 1 | PDIP-16, SOIC-16 | $13.55 |
| DAC7801 | R-2R | 12 | 0.8 | 2 | P12 | 1mA | Ext | 0.012 | 12 | 1 | PDIP-24, SOIC-24 | $17.95 |
| DAC7802 | R-2R | 12 | 0.8 | 2 | P12 | 1mA | Ext | 0.012 | 12 | 1 | PDIP-24, SOIC-24 | $14.00 |
| **DAC7811** | R-2R | 12 | 0.2 | 1 | Serial, SPI | $\pm V_{REF}$/MDAC | Ext | 0.0120 | 12 | 0.0275 | MSOP-10, SON-8 | $3.15 |
| **DAC7821** | R-2R | 12 | 0.2 | 1 | P12 | $\pm V_{REF}$/MDAC | Ext | 0.0120 | 12 | 0.0275 | QFN-20, TSSOP-20 | $3.15 |
| TLC5615 | String | 10 | 12.5 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.1 | 10 | 0.75 | PDIP-8, SOIC-8, VSSOP-8 | $1.90 |
| DAC6571 | String | 10 | 9 | 1 | Serial, $I^2C$ | $V_{DD}$ | Ext | 0.195 | 10 | 0.5 | SOP-6 | $1.40 |
| DAC6573 | String | 10 | 9 | 4 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.195 | 10 | 1.5 | TSSOP-16 | $3.05 |
| DAC6574 | String | 10 | 9 | 4 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.195 | 10 | 1.5 | VSSOP-10 | $3.05 |
| TLV5604 | String | 10 | 3 | 4 | Serial, SPI | $+V_{REF}$ | Ext | 0.05 | 10 | 3 | SOIC-16, TSSOP-16 | $3.70 |
| TLV5606 | String | 10 | 3 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.15 | 10 | 0.9 | SOIC-8, VSSOP-8 | $1.30 |
| TLV5617A | String | 10 | 2.5 | 2 | Serial, SPI | $+V_{REF}$ | Ext | 0.1 | 10 | 1.8 | SOIC-8 | $2.25 |
| TLV5608 | String | 10 | 1 | 8 | Serial, SPI | $+V_{REF}$ | Ext | 0.4 | 10 | 18 | SOIC-20, TSSOP-20 | $4.90 |
| TLV5631 | String | 10 | 1 | 8 | Serial, SPI | $+V_{REF}$ | Int/Ext | 0.4 | 10 | 18 | SOIC-20, TSSOP-20 | $5.60 |
| TLV5637 | String | 10 | 0.8 | 2 | Serial, SPI | +2, 4 | Int/Ext | 0.1 | 10 | 4.2 | SOIC-8 | $3.20 |
| TLC5620 | String | 8 | 10 | 4 | Serial, SPI | $+V_{REF}$ | Ext | 0.4 | 8 | 8 | PDIP-14, SOIC-14 | $1.50 |
| TLC5628 | String | 8 | 10 | 8 | Serial, SPI | $+V_{REF}$ | Ext | 0.4 | 8 | 15 | PDIP-16, SOIC-16 | $2.45 |
| TLV5620 | R-2R | 8 | 10 | 4 | Serial, SPI | $+V_{REF}$ | Ext | 0.2 | 8 | 6 | PDIP-14, SOIC-14 | $1.00 |
| TLV5621 | R-2R | 8 | 10 | 4 | Serial, SPI | $+V_{REF}$ | Ext | 0.4 | 8 | 3.6 | SOIC-14 | $1.65 |
| TLV5628 | String | 8 | 10 | 8 | Serial, SPI | $+V_{REF}$ | Ext | 0.4 | 8 | 12 | PDIP-16, SOIC-16 | $2.20 |
| DAC5571 | String | 8 | 8 | 1 | Serial, $I^2C$ | $V_{DD}$ | Int | 0.195 | 8 | 0.5 | SOP-6 | $0.90 |
| DAC5573 | String | 8 | 8 | 4 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.195 | 8 | 1.5 | TSSOP-16 | $2.55 |
| DAC5574 | String | 8 | 8 | 4 | Serial, $I^2C$ | $+V_{REF}$ | Ext | 0.195 | 8 | 1.5 | VSSOP-10 | $2.55 |
| TLC7225 | R-2R | 8 | 5 | 4 | P8 | $+V_{REF}$ | Ext | 0.4 | 8 | 75 | SOIC-24 | $2.35 |
| TLC7226 | R-2R | 8 | 5 | 4 | P8 | $\pm V_{REF}$ | Ext | 0.4 | 8 | 90 | PDIP-20, SOIC-20 | $2.15 |
| TLV5623 | String | 8 | 3 | 1 | Serial, SPI | $+V_{REF}$ | Ext | 0.2 | 8 | 2.1 | SOIC-8, VSSOP-8 | $0.99 |
| TLV5625 | String | 8 | 3 | 2 | Serial, SPI | $+V_{REF}$ | Ext | 0.2 | 8 | 2.4 | SOIC-8 | $1.70 |
| TLV5627 | String | 8 | 2.5 | 4 | Serial, SPI | $+V_{REF}$ | Ext | 0.2 | 8 | 3 | SOIC-16, TSSOP-16 | $2.05 |
| TLV5624 | String | 8 | 1 | 1 | Serial, SPI | +2, 4 | Int/Ext | 0.2 | 8 | 0.9 | SOIC-8, VSSOP-8 | $1.60 |
| TLV5629 | String | 8 | 1 | 8 | Serial, SPI | Ext | Ext | 0.4 | 8 | 18 | SOIC-20, TSSOP-20 | $3.15 |
| TLV5632 | String | 8 | 1 | 8 | Serial, SPI | +2, 4 | Int/Ext | 0.4 | 8 | 18 | SOIC-20, TSSOP-20 | $3.35 |
| TLV5626 | String | 8 | 0.8 | 2 | Serial, SPI | +2, 4 | Int/Ext | 0.4 | 8 | 4.2 | SOIC-8 | $1.90 |
| TLC7524 | R-2R | 8 | 0.1 | 1 | P8 | 1mA | Ext | 0.2 | 8 | 5 | PDIP-16, PLCC-20, SOIC-16, TSSOP-16 | $1.45 |
| TLC7528 | R-2R | 8 | 0.1 | 2 | P8 | 1mA | Ext | 0.2 | 8 | 7.5 | PDIP-20, PLCC-20, SOIC-20, TSSOP-20 | $1.55 |
| TLC7628 | R-2R | 8 | 0.1 | 2 | P8 | 2mA | Ext | 0.2 | 8 | 20 | SOIC-20, PDIP-20 | $1.45 |

[1] 推荐零售价为每1000片时的美元价格。

前瞻性产品以**粗体蓝色**标明。



## 高速DACs选择指南

| Device | Res. (Bits) | Supply (V) | Update Rate (MSPS) | Settling Time (ns) | Number of DACs | Power Typ (mW) | DNL max (±LSB) | INL max (±LSB) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| DAC904 | 14 | 3.0 to 5.0 | 165 | 30 | 1 | 170 | 1.75 | 2.5 | 28-SOP, 28-TSSOP | $7.35 |
| THS5671A | 14 | 3.0 to 5.0 | 125 | 35 | 1 | 175 | 3.5 | 7 | 28-SOP, 28-TSSOP | $7.35 |
| DAC5687 | 16 | 1.8/3.3 | 500 | 12 | 2 | 750 to 1400 | 3 | 6 | 100-HTQFP | $22.50 |
| DAC902 | 12 | 3.0 to 5.0 | 165 | 30 | 1 | 170 | 1.75 | 2.5 | 28-SOP, 28-TSSOP | $5.95 |
| THS5661A | 12 | 3.0 to 5.0 | 125 | 35 | 1 | 175 | 2.0 | 4 | 28-SOP, 28-TSSOP | $6.60 |
| DAC900 | 10 | 3.0 to 5.0 | 165 | 30 | 1 | 170 | 0.5 | 1 | 28-SOP, 28-TSSOP | $4.20 |
| THS5651A | 10 | 3.0 to 5.0 | 125 | 35 | 1 | 175 | 0.5 | 1 | 28-SOP, 28-TSSOP | $4.50 |
| DAC2904 | 14 | 3.3 to 5.0 | 125 | 30 | 2 | 310 | — | — | 48-TQFP | $12.00 |
| DAC2902 | 12 | 3.3 to 5.0 | 125 | 30 | 2 | 310 | 2.5 | 3 | 48-TQFP | $10.70 |
| DAC2900 | 10 | 3.3 to 5.0 | 125 | 30 | 2 | 310 | 1 | 1 | 48-TQFP | $6.00 |
| DAC5652 | 10 | 3.0 to 3.6 | 200 | 20 | 1 | 290 | 0.5 | 1 | 48-TQFP | $7.60 |
| DAC5662 | 12 | 3.0 to 3.6 | 200 | 20 | 2 | 330 | 2 | 2 | 48-TQFP | $10.70 |
| DAC5672 | 14 | 3.0 to 3.6 | 200 | 20 | 2 | 330 | 3 | 4 | 48-TQFP | $13.25 |
| DAC5675A | 14 | 3.3 | 400 | 12 | 1 | 660 | 2 | 4 | 48-HTQFP | $25.00 |
| DAC5686 | 14 | 1.8/3.3 | 500 | 12 | 2 | 400 | 9 | 12 | 100-HTQFP | $19.75 |
| DAC2932 | 12 | 2.7 to 3.3 | 40 | 25 | 2 | 29 | 0.5 | 2 | 48-TQFP | $8.35 |
| DAC5674 | 12 | 1.8/3.3 | 400 | 20 | 1 | 420 | 2 | 3.5 | 48-HTQFP | $15.00 |

[1] 推荐零售价为每1000片时的美元价格。

## TMS320C28x™控制器系列

| Device[§] | MIPS | Boot ROM | RAM | Flash/ROM | Timers | CAP/QEP | # PWM Channels | # Hi-Res PWM | 12-Bit A/D Chs/Conversion Time (ns) | EMIF | WD Timer | Comm Ports: Other | Comm Ports: SPI | Comm Ports: SCI | Comm Ports: CAN | I/O Pins | Core Voltage (V) | Packaging | ($U.S.)[+] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Flash Devices** | | | | | | | | | | | | | | | | | | | |
| TMS320**F2801**-PZA/S/Q[§] | 100 | 8KB | 12KB | 32KB | 9 | 2/1 | 6 + 2 | 3 | 16Ch/160 | — | Y | I$^2$C | 2 | 1 | 1 | 32 | 1.8 | 100-LQFP | $5.79 |
| TMS320**F2801**-GGMA/S/Q[§] | 100 | 8KB | 12KB | 32KB | 9 | 2/1 | 6 + 2 | 3 | 16Ch/160 | — | Y | I$^2$C | 2 | 1 | 1 | 32 | 1.8 | 100-BGA | $5.79 |
| TMS320**F2806**-PZA/S/Q[§] | 100 | 8KB | 20KB | 64KB | 15 | 4/2 | 12 + 4 | 4 | 16Ch/160 | — | Y | I$^2$C | 4 | 2 | 1 | 32 | 1.8 | 100-LQFP | $8.69 |
| TMS320**F2806**-GGMA/S/Q[§] | 100 | 8KB | 20KB | 64KB | 15 | 4/2 | 12 + 4 | 4 | 16Ch/160 | — | Y | I$^2$C | 4 | 2 | 1 | 32 | 1.8 | 100-BGA | $8.69 |
| TMS320**F2808**-PZA/S/Q[§] | 100 | 8KB | 36KB | 128KB | 15 | 4/2 | 12 + 4 | 4 | 16Ch/160 | — | Y | I$^2$C | 4 | 2 | 2 | 32 | 1.8 | 100-LQFP | $11.52 |
| TMS320**F2808**-GGMA/S/Q[§] | 100 | 8KB | 36KB | 128KB | 15 | 4/2 | 12 + 4 | 4 | 16Ch/160 | — | Y | I$^2$C | 4 | 2 | 2 | 32 | 1.8 | 100-BGA | $11.52 |
| TMS320**F2810**-PBKA/S/Q[§] | 150 | 8KB | 36KB | 128KB | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $13.81 |
| TMS320**F2811**-PBKA/S/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $14.73 |
| TMS320**F2812**-GHHA/S/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 179-BGA | $15.65 |
| TMS320**F2812**-PGFA/S/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 176-LQFP | $15.65 |
| **RAM-Only Devices** | | | | | | | | | | | | | | | | | | | |
| TMS320**R2811**-PBKA/Q[§] | 150 | 8KB | 40KB | — | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $9.11 |
| TMS320**R2812**-GHHA/Q[§] | 150 | 8KB | 40KB | — | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 179-BGA | $10.63 |
| TMS320**R2812**-PGFA/Q[§] | 150 | 8KB | 40KB | — | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 176-LQFP | $10.63 |
| **ROM Devices** | | | | | | | | | | | | | | | | | | | |
| TMS320**C2810**-PBKA/Q[§] | 150 | 8KB | 36KB | 128KB | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $7.05[✦] |
| TMS320**C2811**-PBKA/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | — | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 128-LQFP | $8.22[✦] |
| TMS320**C2812**-GHHA/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 179-BGA | $9.59[✦] |
| TMS320**C2812**-PGFA/Q[§] | 150 | 8KB | 36KB | 256KB | 7 | 6/2 | 16 | — | 16Ch/80 | Y | Y | McBSP | 1 | 2 | 1 | 56 | 1.9 | 176-LQFP | $9.59[✦] |

[+] 报价单位为美元，此处为2006年的建议零售价。所有的价格都有可能改变。在此建议客户在下订单前先从TI获取最近的完整价格信息。TI会在接受订单前核实最终价格。

[✦] C281x器件的最小批量为10KU，非重复性工程费用(NRE)为11,000美元。

[§] A= -40°至85°C；S= -40°至125°C (较A需加价10%)； Q = -40°至125°C, 符合Q100标准(较S需加价15%)

所列器件均可提供无铅绿色封装版本。



## 微控制器

### MSP430超低功耗微控制器选择指南

| Device | Prgm. (kB) | SRAM | I/O | Timer A | Timer B | DMA | USART | SPI, $I^2C$ | SVS | BOR | MPY | Comp A | Temp Sensor | ADC Ch/Res | DAC Ch/Res | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Flash/ROM-Based x1xx Family with 16-Bit Watchdog ($V_{CC}$ 1.8V to 3.6V)** | | | | | | | | | | | | | | | | | |
| MSP430F1101A | 1 | 128 | 14 | 3 | — | — | — | — | — | — | — | ✓ | — | Slope | — | 20-SOIC, 20-TSSOP 20-TVSOP, 24-QFN | $0.99 |
| MSP430C1101 | 1 | 128 | 14 | 3 | — | — | — | — | — | — | — | ✓ | — | Slope | — | 20-SOP, 20-TSSOP, 24-QFN | $0.60 |
| MSP430F1111A | 2 | 128 | 14 | 3 | — | — | — | — | — | — | — | ✓ | — | Slope | — | 20-SOIC, 20-TSSOP 20-TVSOP, 24-QFN | $1.35 |
| MSP430C1111 | 2 | 128 | 14 | 3 | — | — | — | — | — | — | — | ✓ | — | Slope | — | 20-SOP, 20-TSSOP, 24-QFN | $1.10 |
| MSP430F1121A | 4 | 256 | 14 | 3 | — | — | — | — | — | — | — | ✓ | — | Slope | — | 20-SOIC, 20-TSSOP 20-TVSOP, 24-QFN | $1.70 |
| MSP430C1121 | 4 | 256 | 14 | 3 | — | — | — | — | — | — | — | ✓ | — | Slope | — | 20-SOP, 20-TSSOP, 24-QFN | $1.35 |
| MSP430F1122 | 4 | 256 | 14 | 3 | — | — | — | — | — | ✓ | — | — | ✓ | 5/10 | — | 20-SOIC, 20-TSSOP, 32-QFN | $2.00 |
| MSP430F1132 | 8 | 256 | 14 | 3 | — | — | — | — | — | ✓ | — | — | ✓ | 5/10 | — | 20-SOIC, 20-TSSOP, 32-QFN | $2.25 |
| MSP430F1222 | 4 | 256 | 22 | 3 | — | — | 1 | — | — | ✓ | — | — | ✓ | 8/10 | — | 28-SOIC, 28-TSSOP, 32-QFN | $2.40 |
| MSP430F1232 | 8 | 256 | 22 | 3 | — | — | 1 | — | — | ✓ | — | — | ✓ | 8/10 | — | 28-SOIC, 28-TSSOP, 32-QFN | $2.50 |
| MSP430F122 | 4 | 256 | 22 | 3 | — | — | 1 | — | — | — | — | ✓ | — | Slope | — | 28-SOIC, 28-TSSOP, 32-QFN | $2.15 |
| MSP430F123 | 8 | 256 | 22 | 3 | — | — | 1 | — | — | — | — | ✓ | — | Slope | — | 28-SOIC, 28-TSSOP, 32-QFN | $2.30 |
| MSP430C1331 | 8 | 256 | 48 | 3 | 3 | — | 1 | — | — | — | — | ✓ | — | Slope | — | 64-TQFP, 64-QFN | $2.00 |
| MSP430C1351 | 16 | 512 | 48 | 3 | 3 | — | 1 | — | — | — | — | ✓ | — | Slope | — | 64-TQFP, 64-QFN | $2.30 |
| MSP430F133 | 8 | 256 | 48 | 3 | 3 | — | 1 | — | — | — | — | ✓ | ✓ | 8/12 | — | 64-LQFP, 64-TQFP, 64-QFN | $3.00 |
| MSP430F135 | 16 | 512 | 48 | 3 | 3 | — | 1 | — | — | — | — | ✓ | ✓ | 8/12 | — | 64-LQFP, 64-TQFP, 64-QFN | $3.60 |
| MSP430F147 | 32 | 1024 | 48 | 3 | 7 | — | 2 | — | — | — | ✓ | ✓ | ✓ | 8/12 | — | 64-LQFP, 64-TQFP, 64-QFN | $5.05 |
| MSP430F148 | 48 | 2048 | 48 | 3 | 7 | — | 2 | — | — | — | ✓ | ✓ | ✓ | 8/12 | — | 64-LQFP, 64-TQFP, 64-QFN | $5.75 |
| MSP430F149 | 60 | 2048 | 48 | 3 | 7 | — | 2 | — | — | — | ✓ | ✓ | ✓ | 8/12 | — | 64-LQFP, 64-TQFP, 64-QFN | $6.05 |
| MSP430F1471 | 32 | 1024 | 48 | 3 | 7 | — | 2 | — | — | — | ✓ | ✓ | — | Slope | — | 64-LQFP, 64-QFN | $4.60 |
| MSP430F1481 | 48 | 2048 | 48 | 3 | 7 | — | 2 | — | — | — | ✓ | ✓ | — | Slope | — | 64-LQFP, 64-QFN | $5.30 |
| MSP430F1491 | 60 | 2048 | 48 | 3 | 7 | — | 2 | — | — | — | ✓ | ✓ | — | Slope | — | 64-LQFP, 64-QFN | $5.60 |
| MSP430F155 | 16 | 512 | 48 | 3 | 3 | ✓ | 1 | ✓ | ✓ | ✓ | — | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $4.95 |
| MSP430F156 | 24 | 1024 | 48 | 3 | 3 | ✓ | 1 | ✓ | ✓ | ✓ | — | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $5.55 |
| MSP430F157 | 32 | 1024 | 48 | 3 | 3 | ✓ | 1 | ✓ | ✓ | ✓ | — | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $5.85 |
| MSP430F167 | 32 | 1024 | 48 | 3 | 7 | ✓ | 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $6.75 |
| MSP430F168 | 48 | 2048 | 48 | 3 | 7 | ✓ | 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $7.45 |
| MSP430F169 | 60 | 2048 | 48 | 3 | 7 | ✓ | 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $7.95 |
| MSP430F1610 | 32 | 5120 | 48 | 3 | 7 | ✓ | 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $8.25 |
| MSP430F1611 | 48 | 10240 | 48 | 3 | 7 | ✓ | 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $8.65 |
| MSP430F1612 | 55 | 5120 | 48 | 3 | 7 | ✓ | 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | 2/12 | 64-LQFP | $8.95 |
| **Flash-Based F2xx Family with 16 MIPS and 16-Bit Watchdog ($V_{CC}$ 1.8-3.6V)** | | | | | | | | | | | | | | | | | |
| **MSP430F2001** | 1 | 128 | 10 | 2 | — | — | — | — | — | ✓ | — | ✓[2] | — | Slope | — | 14-TSSOP, 14-PDIP, 16-QFN | $0.55 |
| **MSP430F2011** | 2 | 128 | 10 | 2 | — | — | — | — | — | ✓ | — | ✓[2] | — | Slope | — | 14-TSSOP, 14-PDIP, 16-QFN | $0.70 |
| **MSP430F2002** | 1 | 128 | 10 | 2 | — | — | ✓ | — | — | ✓ | — | — | ✓ | 1/10 | — | 14-TSSOP, 14-PDIP, 16-QFN | $0.99 |
| **MSP430F2012** | 2 | 128 | 10 | 2 | — | — | ✓ | — | — | ✓ | — | — | ✓ | 1/10 | — | 14-TSSOP, 14-PDIP, 16-QFN | $1.15 |
| **MSP430F2003** | 1 | 128 | 10 | 2 | — | — | ✓ | — | — | ✓ | — | — | ✓ | 1/16 | — | 14-TSSOP, 14-PDIP, 16-QFN | $1.49 |
| **MSP430F2013** | 2 | 128 | 10 | 2 | — | — | ✓ | — | — | ✓ | — | — | ✓ | 1/16 | — | 14-TSSOP, 14-PDIP, 16-QFN | $1.65 |
| MSP430F2101 | 1 | 128 | 16 | 3 | — | — | — | — | — | ✓ | — | ✓[2] | — | Slope | — | 20-TSSOP, 20-SOIC, 24-QFN | $0.90 |
| MSP430F2111 | 2 | 128 | 16 | 3 | — | — | — | — | — | ✓ | — | ✓[2] | — | Slope | — | 20-TSSOP, 20-SOIC, 24-QFN | $0.99 |
| MSP430F2121 | 4 | 256 | 16 | 3 | — | — | — | — | — | ✓ | — | ✓[2] | — | Slope | — | 20-TSSOP, 20-SOIC, 24-QFN | $1.35 |
| MSP430F2131 | 8 | 256 | 16 | 3 | — | — | — | — | — | ✓ | — | ✓[2] | — | Slope | — | 20-TSSOP, 20-SOIC, 24-QFN | $1.70 |
| **MSP430F2234** | 8 | 512 | 32 | 3 | 3 | — | ✓ | — | — | ✓ | — | — | — | 1/10 | 2/Amp | 38-TSOP, 40-QFN | $2.75 |
| **MSP430F2254** | 16 | 512 | 32 | 3 | 3 | — | ✓ | — | — | ✓ | — | — | — | 1/10 | 2/Amp | 38-TSOP, 40-QFN | $3.15 |
| **MSP430F2274** | 32 | 1024 | 32 | 3 | 3 | — | ✓ | — | — | ✓ | — | — | — | 1/10 | 2/Amp | 38-TSOP, 40-QFN | $3.55 |

[1] 推荐零售价为每1000片时的美元价格。 [2] 比较器 μA+。

前瞻性产品以**粗体蓝色**标明。



## MSP430超低功耗微控制器选择指南（续）

| Device | Prgm. (kB) | SRAM (B) | I/O | Timer A | Timer B | USART, USCI[2] | LCD Segments | DMA | SVS | BOR | MPY | Comp A | Temp Sensor | ADC Ch/Res | DAC Ch/Res | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Flash/ROM-Based x4xx Family with LCD Driver and 16-bit Watchdog ($V_{CC}$ 1.8V - 3.6V) (Continued)** | | | | | | | | | | | | | | | | | |
| MSP430F412/C412 | 4 | 256 | 48 | 3 | — | — | 96 | — | ✓ | ✓ | — | ✓ | — | Slope | — | 64-LQFP, 64-QFN | $2.60/1.90 |
| MSP430F413/C413 | 8 | 256 | 48 | 3 | — | — | 96 | — | ✓ | ✓ | — | ✓ | — | Slope | — | 64-LQFP, 64-QFN | $2.95/2.10 |
| MSP430F415 | 16 | 512 | 48 | 3, 5 | — | — | 96 | — | ✓ | ✓ | — | ✓ | — | Slope | — | 64-LQFP, 64-QFN | $3.40 |
| MSP430F417 | 32 | 1024 | 48 | 3, 5 | — | — | 96 | — | ✓ | ✓ | — | ✓ | — | Slope | | 64-LQFP, 64-QFN | $3.90 |
| MSP430FW423 | 8 | 256 | 48 | 3, 5 | — | — | 96 | — | ✓ | ✓ | — | ✓ | — | Slope | Flow-meter | 64-LQFP | $3.75 |
| MSP430FW425 | 16 | 512 | 48 | 3, 5 | — | — | 96 | — | ✓ | ✓ | — | ✓ | — | Slope | Flow-meter | 64-LQFP | $4.05 |
| MSP430FW427 | 32 | 1024 | 48 | 3, 5 | — | — | 96 | — | ✓ | ✓ | — | ✓ | — | Slope | Flow-meter | 64-LQFP | $4.45 |
| MSP430F4250 | 16 | 256 | 32 | 3 | — | — | 56 | — | — | ✓ | — | — | ✓ | 1/16 | 1/12 | 64-LQFP | $3.10 |
| MSP430F4260 | 24 | 256 | 32 | 3 | — | — | 56 | — | — | ✓ | — | — | ✓ | 1/16 | 1/12 | 64-LQFP | $3.45 |
| MSP430F4270 | 32 | 256 | 32 | 3 | — | — | 56 | — | — | ✓ | — | — | ✓ | 1/16 | 1/12 | 48-SSOP, 48-QFN | $3.80 |
| MSP430F423 | 8 | 256 | 14 | 3 | — | 1 | 128 | — | ✓ | ✓ | ✓ | — | ✓ | 3/16 | — | 48-SSOP, 48-QFN | $4.50 |
| MSP430F425 | 16 | 512 | 14 | 3 | — | 1 | 128 | — | ✓ | ✓ | ✓ | — | ✓ | 3/16 | — | 48-SSOP, 48-QFN | $4.95 |
| MSP430F427 | 32 | 1024 | 14 | 3 | — | 1 | 128 | — | ✓ | ✓ | ✓ | — | ✓ | 3/16 | — | 64-LQFP | $5.40 |
| MSP430FE423 | 8 | 256 | 14 | 3 | — | 1 | 128 | — | ✓ | ✓ | ✓ | — | ✓ | 3/16 | E-meter | 64-LQFP | $4.85 |
| MSP430FE425 | 16 | 512 | 14 | 3 | — | 1 | 128 | — | ✓ | ✓ | ✓ | — | ✓ | 3/16 | E-meter | 64-LQFP | $5.45 |
| MSP430FE427 | 32 | 1024 | 14 | 3 | — | 1 | 128 | — | ✓ | ✓ | ✓ | — | ✓ | 3/16 | E-meter | 64-LQFP | $5.95 |
| MSP430F435 | 16 | 512 | 48 | 3 | 3 | 1 | 128/160 | — | ✓ | ✓ | — | ✓ | ✓ | 8/12 | — | 80-LQFP, 100-LQFP | $4.45 |
| MSP430F436 | 24 | 1024 | 48 | 3 | 3 | 1 | 128/160 | — | ✓ | ✓ | — | ✓ | ✓ | 8/12 | — | 80-LQFP, 100-LQFP | $4.70 |
| MSP430F437 | 32 | 1024 | 48 | 3 | 3 | 1 | 128/160 | — | ✓ | ✓ | — | ✓ | ✓ | 8/12 | — | 80-LQFP, 100-LQFP | $4.90 |
| MSP430FG437 | 32 | 1024 | 48 | 3 | 3 | 1 | 128 | ✓ | ✓ | ✓ | — | ✓ | ✓ | 12/12 | 2/12 | 80-LQFP | $6.50 |
| MSP430FG438 | 48 | 2048 | 48 | 3 | 3 | 1 | 128 | ✓ | ✓ | ✓ | — | ✓ | ✓ | 12/12 | 2/12 | 80-LQFP | $7.35 |
| MSP430FG439 | 60 | 2048 | 48 | 3 | 3 | 1 | 128 | ✓ | ✓ | ✓ | — | ✓ | ✓ | 12/12 | 2/12 | 80-LQFP | $7.95 |
| MSP430F447 | 32 | 1024 | 48 | 3 | 7 | 2 | 128 | — | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | — | 100-LQFP | $5.75 |
| MSP430F448 | 48 | 2048 | 48 | 3 | 7 | 2 | 128 | — | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | — | 100-LQFP | $6.50 |
| MSP430F449 | 60 | 2048 | 48 | 3 | 7 | 2 | 128 | — | ✓ | ✓ | ✓ | ✓ | ✓ | 8/12 | — | 100-LQFP | $7.05 |
| **MSP430FG4616** | 92 | 4096 | 80 | 3 | 7 | 1, 2 | 160 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 12/12 | 2/12 | 100-LQFP | 9.45 |
| **MSP430FG4617** | 92 | 8192 | 80 | 3 | 7 | 2, 2 | 160 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 12/12 | 2/12 | 100-LQFP | 9.35 |
| **MSP430FG4618** | 116 | 8192 | 80 | 3 | 7 | 2, 2 | 160 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 12/12 | 2/12 | 100-LQFP | 10.35 |
| **MSP430FG4619** | 120 | 4096 | 80 | 3 | 7 | 2, 2 | 160 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 12/12 | 2/12 | 100-LQFP | $9.95 |

[1] 推荐零售价为每1000片时的美元价格。 [2] 包括 UART、IrDA、SPI以及$I^2C$。

前瞻性产品以**粗体蓝色**标明。

## 控制器局域网(CAN)选择指南

| Supply Voltage (V) | Device | Description | Transient Pulse Protection (V) | $I_{CC}$ max (mA) | ESD (kV) | Bus Fault Protection (V) | Footprint | Temp Range (°C) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | SN65HVD251 | Standby, improved drop-in for PCA82C250/1 | –200 to 200 | 65 | 14 | ±36 | PCA82C250 | –40 to 125 | 8-PDIP, 8-SOIC | $0.90 |
| 5 | **SN65HVD1040** | Improved drop-in replacement for TJA1040 | –200 to 200 | 70 | 6 | –27 to 40 | TJA1040 | –40 to 125 | 8-SOIC | — |
| 5 | **SN65HVD1050** | Improved drop-in replacement for TJA1050 | –200 to 200 | 70 | 6 | –27 to 40 | TJA1050 | –40 to 125 | 8-SOIC | — |
| 5 | SN65LBC031 | 500Kbps | –150 to 100 | 20 | 2 | –5 to 20 | SN75LBC031 | –40 to 125 | 8-SOIC | $1.50 |
| 3.3 | SN65HVD230 | Standby mode | –25 to 25 | 17 | 16 | –4 to 16 | PCA82C250 | –40 to 85 | 8-SOIC | $1.35 |
| 3.3 | SN65HVD231 | Sleep mode | –25 to 25 | 17 | 16 | –4 to 16 | PCA82C250 | –40 to 85 | 8-SOIC | $1.35 |
| 3.3 | SN65HVD232 | Cost effective | –25 to 25 | 17 | 16 | –4 to 16 | SN65HVD232 | –40 to 85 | 8-SOIC | $1.30 |
| 3.3 | SN65HVD230Q | Automotive temp, standby mode | –25 to 25 | 17 | 15 | –7 to 16 | PCA82C250 | –40 to 125 | 8-SOIC | $1.55 |
| 3.3 | SN65HVD231Q | Automotive temp, sleep mode | –25 to 25 | 17 | 15 | –7 to 16 | PCA82C250 | –40 to 125 | 8-SOIC | $1.55 |
| 3.3 | SN65HVD232Q | Automotive temp, cost effective | –25 to 25 | 17 | 15 | –7 to 16 | SN65HVD232 | –40 to 125 | 8-SOIC | $1.50 |
| 3.3 | SN65HVD233 | Standby mode, diagnostic loop-back | –100 to 100 | 6 | 16 | ±36 | — | –40 to 125 | 8-SOIC | $1.50 |
| 3.3 | SN65HVD234 | Standby mode, sleep mode | –100 to 100 | 6 | 16 | ±36 | — | –40 to 125 | 8-SOIC | $1.45 |
| 3.3 | SN65HVD235 | Standby mode, autobaud loop-back | –100 to 100 | 6 | 16 | ±36 | — | –40 to 125 | 8-SOIC | $1.50 |

[1] 推荐零售价为每1000片时的美元价格。除LBC031以外，所列器件信号率均为1Mbps。

前瞻性产品以**粗体蓝色**标明。



## 接口

### RS-485接口器件选择指南

| No. of Dr/Rx | | Supply (V) | Enables | Device | Features | Signaling Rate (Mbps) | ESD (kV) | Receiver Fail-Safe | Nodes | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/1 | Half-Duplex | 3.3 | DE, RE | SN65HVD12 | 3.3V Supply – Low-Speed Slew-Rate Control | 1 | 15 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC | $1.75 |
| | | | DE, RE | SN65HVD11 | 3.3V Supply – Low-Speed Slew-Rate Control | 10 | 15 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC | $1.80 |
| | | | DE, RE | SN65HVD10 | 3.3V Supply – High-Speed Signaling | 25 | 15 | Short, Open, Idle | 64 | 8-PDIP, 8-SOIC | $1.85 |
| | | 3 to 5 | DE, RE | SN65HVD08 | Wide Supply Range: 3 to 5.5V | 10 | 15 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC | $1.90 |
| | | 5 | DE, RE | SN65HVD3082E | Low Power Mode, Optimized for Low-Speed | 0.2 | 15 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC, 8-MSOP | $0.90 |
| | | | DE, RE | SN65HVD3085E | Low Power Mode, Optimized for Mid-Speed | 1 | 15 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC, 8-MSOP | $0.90 |
| | | | DE, RE | SN65HVD3088E | Low Power Mode, Optimized for High-Speed | 10 | 15 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC, 8-MSOP | $1.00 |
| | | | DE, RE | SN65HVD485E | Half Duplex Transceiver | 10 | 15 | Open | 64 | 8-PDIP, 8-SOIC, 8-MSOP | $0.70 |
| | | | DE, RE | SN65HVD1176 | PROFIBUS Transceiver, EN 50170 | 40 | 10 | Short, Open, Idle | 160 | 8-SOIC | $1.55 |
| | | | DE, RE | SN65HVD22 | –20V to 25V Common Mode Operation | 0.5 | 16 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC | $1.65 |
| | | | DE, RE | SN65HVD21 | –20V to 25V Common Mode, 5Mbps | 5 | 16 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC | $1.65 |
| | | | DE, RE | SN65HVD20 | –20V to 25V Common Mode, 25Mbps | 25 | 16 | Short, Open, Idle | 64 | 8PDIP, 8-SOIC | $1.65 |
| | | | DE, RE | SN65HVD23 | Receiver Equalization, 160 Meters at 25 Mbps | 25 | 16 | Short, Open, Idle | 64 | 8-PDIP, 8-SOIC | $1.80 |
| | | | DE, RE | SN65HVD24 | Receiver Equalization, 500 Meters at 3 Mbps | 3 | 16 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC | $1.80 |
| | | | DE, RE | SN65HVD07 | Strong Driver Outputs – Low Signal Rate | 1 | 16 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC | $1.50 |
| | | | DE, RE | SN65HVD06 | Strong Driver Outputs – Mid Signal Rate | 10 | 16 | Short, Open, Idle | 256 | 8-PDIP, 8-SOIC | $1.55 |
| | | | DE, RE | SN65HVD05 | Strong Driver Outputs – Fast Signal Rate | 40 | 16 | Short, Open, Idle | 64 | 8-PDIP, 8-SOIC | $1.60 |
| | | | DE, RE | SN65LBC176 | Low Power | 10 | 2 | Open | 32 | 8-PDIP, 8-SOIC | $0.90 |
| | | | DE, RE | SN65LBC176A | Low Power, Fast Signaling, ESD Protection | 30 | 12 | Open | 32 | 8-PDIP, 8-SOIC | $1.20 |
| | | | DE, RE | SN65LBC184 | Transient Protection, IEC Air, Contact, Surge | 0.25 | 30 | Open | 128 | 8-PDIP, 8-SOIC | $1.30 |
| | | | DE, RE | SN65LBC182 | IEC ESD Protection, Air and Contact Tests | 0.25 | 15 | Open | 128 | 8-PDIP, 8-SOIC | $1.05 |
| | | | DE, RE | SN65ALS176 | Fast Signaling, Skew: 15ns | 35 | 2 | Open | 32 | 8-SOIC | $1.26 |
| | | | DE, RE | SN65176B | Cost Effective | 10 | 2 | None | 32 | 8-PDIP, 8-SOIC, 8-SOP | $0.44 |
| | Full-Duplex | 3.3 | No | SN65HVD30 | 3.3V Supply, no Enables, 25Mbps | 25 | 15 | Short, Open, Idle | 64 | 8-SOIC | Preview |
| | | | No | SN65HVD31 | 3.3V Supply, no Enables, 5Mbps | 5 | 15 | Short, Open, Idle | 256 | 8-SOIC | Preview |
| | | | No | SN65HVD32 | 3.3V Supply, no Enables, 1Mbps | 1 | 15 | Short, Open, Idle | 256 | 8-SOIC | Preview |
| | | | DE, RE | SN65HVD33 | 3.3V Supply, with Enables, 25Mbps | 25 | 15 | Short, Open, Idle | 64 | 14-SOIC | $1.70 |
| | | | DE, RE | SN65HVD34 | 3.3V Supply, with Enables, 5Mbps | 5 | 15 | Short, Open, Idle | 256 | 14-SOIC | $1.70 |
| | | | DE, RE | SN65HVD35 | 3.3V Supply, with Enables, 1Mbps | 1 | 15 | Short, Open, Idle | 256 | 14-SOIC | $1.70 |
| | | 5 | No | SN65HVD50 | Strong Bus Outputs, no Enables, 25Mbps | 25 | 15 | Short, Open, Idle | 64 | 8-SOIC | Preview |
| | | | No | SN65HVD51 | Strong Bus Outputs, no Enables, 5Mbps | 5 | 15 | Short, Open, Idle | 256 | 8-SOIC | Preview |
| | | | No | SN65HVD52 | Strong Bus Outputs, no Enables, 1Mbps | 1 | 15 | Short, Open, Idle | 256 | 8-SOIC | Preview |
| | | | No | SN65LBC179 | Low Power, without Enable | 10 | 2 | Open | 32 | 8-PDIP, 8-SOIC | $0.85 |
| | | | No | SN65LBC179A | High Signaling Rate, High ESD w/o Enables | 30 | 10 | Open | 32 | 8-PDIP, 8-SOIC | $1.10 |
| | | | DE, RE | SN65HVD53 | Strong Bus Outputs, with Enables, 25Mbps | 25 | 15 | Short, Open, Idle | 64 | 14-SOIC | $1.60 |
| | | | DE, RE | SN65HVD54 | Strong Bus Outputs, with Enables, 5Mbps | 5 | 15 | Short, Open, Idle | 256 | 14-SOIC | $1.60 |
| | | | DE, RE | SN65HVD55 | Strong Bus Outputs, with Enables, 1Mbps | 1 | 15 | Short, Open, Idle | 256 | 14-SOIC | $1.60 |
| | | | DE, RE | SN65LBC180 | Low Power, with Enables | 10 | 2 | Open | 32 | 14-PDIP, 14-SOIC, 16-QFN | $1.05 |
| | | | DE, RE | SN65LBC180A | High Signaling Rate, High ESD with Enables | 30 | 10 | Open | 32 | 14-PDIP, 14-SOIC | $1.35 |
| | | | DE, RE | SN65ALS180 | High Signaling Rate, with Enables | 25 | 2 | Open | 32 | 14-SOIC | $1.71 |
| 3/3 | Triple | | Separate DIR | SN65LBC170 | FAST-20 SCSI, Skew: 3ns | 30 | 12 | Open | 32 | 20-SOIC, 16-SSOP | $4.10 |
| | | | DE, Triple RE | SN65LBC171 | FAST-20 SCSI, Skew: 3ns | 30 | 12 | Open | 32 | 20-SOIC, 20-SSOP | $4.10 |
| 4/0 | Quad-Drivers | | Complementary | SN65LBC172 | Low Power | 10 | 2 | — | 32 | 16-PDIP, 20-SOIC | $1.80 |
| | | | Complementary | SN65LBC172A | High Signaling Rate, High ESD | 30 | 13 | — | 32 | 16-PDIP, 16-SOIC, 20-SOIC | $2.40 |
| | | | Pairwise | SN65LBC174A | Low Power | 10 | 2 | — | 32 | 16-PDIP, 20-SOIC | $1.90 |
| | | | Pairwise | SN65LBC174A | High Signaling Rate, High ESD | 30 | 13 | — | 32 | 16-PDIP, 16-SOIC, 20-SOIC | $2.50 |
| 3/3 | Quad-Receivers | | Complementary | SN65LBC173 | Low Power | 10 | 2 | Open | 32 | 16-PDIP, 16-SOIC | $1.15 |
| | | | Complementary | SN65LBC173A | High Signaling Rate, High ESD, Low Power | 50 | 6 | Short, Open, Idle | 32 | 16-PDIP, 16-SOIC | $1.50 |
| | | | Pairwise | SN65LBC175 | Low Power | 10 | 2 | Open | 32 | 16-PDIP, 16-SOIC | $1.10 |
| | | | Pairwise | SN65LBC175A | High Signaling Rate, High ESD, Low Power | 50 | 6 | Short, Open, Idle | 32 | 16-PDIP, 16-SOIC | $1.40 |
| | | | Pairwise | SN65175 | Standard | 10 | 2 | None | 32 | 16-PDIP, 16-SOIC, 16-SOP | $2.70 |

[1] 推荐零售价为每1000片时的美元价格。



## RS-232接口器件选择指南

| Device | Description | Drivers per Pkg. | Receivers per Pkg. | Supply Voltage(s) (V) | $I_{CC}$ (mA) (max) | Footprint | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|
| TL145406 | Triple RS-232 Drivers/Receivers | 3 | 3 | ±12, 5 | 20 | MC14506 | PDIP, SOIC | $0.94 |
| GD75232 | Multiple RS-232 Drivers and Receivers | 3 | 5 | ±12, 5 | 20 | GD75232 | PDIP, SOIC, SSOP, TSSOP | $0.22 |
| MAX3243 | 3V to 5.5V Multichannel RS-232 Line Driver/Receiver with ±15kV ESD (HBM) Protection | 3 | 5 | 3.3, 5 | 1 | MAX3243 | SOIC, SSOP, TSSOP | $0.99 |
| MAX202 | 5V Dual RS-232 Line Driver/Receiver with ±15kV ESD Protection | 2 | 2 | 5 | 15 | MAX202 | SOIC, TSSOP | $0.58 |
| **MAX207** | 5V Multichannel RS-232 Line Driver/Receiver with ±15kV ESD Protection | 5 | 3 | 5 | 20 | MAX207 | SOIC, SSOP | $1.08 |
| MAX211 | 5V Multichannel RS-232 Line Driver/Receiver with ±15kV ESD Protection | 4 | 5 | 5 | 20 | MAX211 | SOIC, SSOP | $1.08 |
| **MAX222** | 5V Dual RS-232 Line Driver/Receiver with ±15kV ESD Protection | 2 | 2 | 5 | 10 | MAX222 | SOIC | $1.26 |
| SN65C3243 | 3V to 5.5V Multichannel RS-232 Line Driver/Receiver | 3 | 5 | 3.3 or 5 | 1 | MAX3234 | SOIC, SSOP, TSSOP | $3.46 |
| SN75185 | Multiple RS-232 Drivers and Receivers | 3 | 5 | ±12, 5 | 30 | SN75185 | PDIP, SOIC | $0.43 |
| SN75C185 | Low-Power Multiple Drivers and Receivers | 3 | 5 | ±12, 5 | 0.75 | SN75C185 | PDIP, SOIC | $0.90 |
| SN75C3234 | 3V to 5.5V Multichannel RS-232 Line Driver/Receiver | 3 | 5 | 3.3 to 5 | 1 | MAX3243 | SOIC, SSOP, TSSOP | $2.02 |
| SN75LBC187 | Multichannel EIA-232 Driver/Receiver with Charge Pump | 3 | 5 | 5 | 30 | SN75LBC187 | SSOP | $3.60 |
| SN75LP1185 | Low-Power Multiple RS-232 Drivers and Receivers | 3 | 5 | 5, ±12 | 1 | SN75LP185 | PDIP, SOIC, SSOP | $1.53 |
| SN75LPE185 | Low-Power Multiple Drivers and Receivers | 3 | 5 | 5, ±12 | 1 | SN75LP185 | PDIP, SOIC, SSOP, TSSOP | $1.62 |
| SN75LV4737A | 3V to 5.5V Multichannel RS-232 Line Driver/Receiver | 3 | 5 | 3 or 5 | 1 | MAX3243 | SOIC, SSOP, TSSOP | $2.61 |
| LT1030 | Quad Low-Power Line Driver | 4 | 0 | ±5 | 1 | LT1030 | PDIP, SOIC | $0.81 |
| MC1488 | Quad Line Driver | 4 | 0 | ±9 | 25 | MC1488 | PDIP | $0.20 |
| SN55188 | Quad Line Driver | 4 | 0 | ±9 | | MC1488 | CDIP, CFP, LCCC | $1.97 |
| SN75188 | Quad Line Driver | 4 | 0 | ±9 | 25 | MC1488 | PDIP, SOIC, SOP | $0.18 |
| SN75C188 | Quad Low-Power Line Driver | 4 | 0 | ±12 | 0.16 | MC1488 | PDIP, SOIC, SOP, SSOP | $0.31 |
| SN75C198 | Quad Low-Power Line Driver | 4 | 0 | ±12 | 0.32 | — | PDIP, SOIC | $2.25 |
| SN75154 | Quad Differential Line Receiver | 4 | 4 | 5 or 12 | 35 | SN75154 | PDIP, SOIC, SOP | $0.41 |
| SN75C1154 | Quad Low-Power Drivers/Receivers | 4 | 4 | ±12, 5 | — | — | PDIP, SOIC, SOP | $0.76 |
| SN75LBC241 | Low-Power LinBiCMOS™ Multiple Drivers and Receivers | 4 | 5 | 5 | 8 | MAX241 | SOIC | $1.73 |
| GD75323 | Multiple RS-232 Drivers and Receivers | 5 | 3 | ±12, 5 | 32 | GD75323 | SOIC | $0.22 |
| MAX3238 | 3V to 5.5V Multichannel RS-232 Line Driver/Receiver | 5 | 3 | 3.3, 5 | 2 | MAX3238 | SSOP, TSSOP | $1.13 |
| SN65C3238 | 3V to 5.5V Multichannel RS-232 Line Driver/Receiver | 5 | 3 | 3.3 or 5 | 2 | MAX3238 | SOIC, SSOP, TSSOP | $3.24 |
| SN75196 | Multiple RS-232 Driver and Receiver | 5 | 3 | ±12, 5 | 20 | SN75196 | PDIP, SOIC | $0.41 |
| SN75C3238 | 3V to 5.5V Multichannel RS-232 Line Driver/Receiver | 5 | 3 | 3.3 or 5 | 2 | MAX3238 | SOIC, SSOP, TSSOP | $2.81 |
| SN75LP196 | Low-Power Multiple RS-232 Drivers and Receivers | 5 | 3 | 5, ±12 | 1 | SN75LP185 | PDIP, SOIC, SSOP, TSSOP | $1.53 |
| SN65C23243 | 3V to 5.5V Dual RS-232 Port | 6 | 10 | 3.3, 5 | 0.02 | — | SSOP, TSSOP | $4.32 |
| SN752232 | Dual RS-232 Port | 6 | 10 | 5 | ±50 | — | SSOP, TSSOP | $0.81 |
| SN75C23243 | 3V to 5.5V Dual RS-232 Port | 6 | 10 | 3.3, 5 | 0.02 | — | SSOP, TSSOP | $3.42 |
| UC5171 | Octal Line Driver with TTL Mode Selection | 8 | 0 | ±9 to ±15 | 42 | — | PLCC | $6.33 |
| UC5172 | Octal Line Driver with Long Line Drive | 8 | 0 | ±9 to ±15 | 25 | — | PDIP, PLCC | $3.25 |

[1] 推荐零售价为每1000片时的美元价格。

新产品以**粗体红色**标明。



## 接口

### 1394b 媒体接口概况

| Device | Reach | s100 | s200 | s400 | s800 | s1600 | s3200 |
|---|---|---|---|---|---|---|---|
| UTP-5 | 100m | X | — | — | — | — | — |
| POF/HPCF | 100m | X | X | X | X | X | — |
| 50µm GOF | 100m | — | — | X | X | X | X |
| STP (beta) | 4.5m | — | — | X | X | X | X |
| STP (DS) | 4.5m | X | X | X | — | — | — |

*对于工业及需要大带宽实时数据的系统来说，器件更快的速度及更远的传输距离能有效的增强了其多功能性。*

### 1394链路层控制器选择指南

| Device | Supply Voltage (V) | Speed Max (Mbps) | FIFO (kb) | Pin/ Package | Description | Price[1] |
|---|---|---|---|---|---|---|
| TSB12C01A | 5 | 100 | 2 | 100-LQFP | High-Performance 5V Link Layer with 32-Bit Host I/F, 2kb FIFOs | $11.75 |
| TSB12LV01B | 3.3 | 400 | 2 | 100-TQFP | High-Performance 1394 3.3V Link Layer for Telecom, Embedded & Industrial App., 32-Bit I/F, 2kb FIFO | $8.90 |
| TSB12LV21B | 3.3 | 400 | 4 | 176-LQFP | PCILynx™ - PCI to 1394 3.3V Link Layer with 32-Bit PCI I/F, 4kb FIFOs | $9.60 |
| TSB12LV26 | 3.3 | 400 | 9 | 100-TQFP | OHCI-Lynx™ PCI-Based IEEE 1394 Host Controller | $3.95 |
| TSB12LV32 | 3.3 | 400 | 4 | 100-LQFP | General-Purpose Link Layer Controller (GP2Lynx) | $5.15 |
| TSB42AA4 | 3.3 | 400 | 8 | 128-TQFP | 1394 Link Layer Controller with DTCP Content Protection for Consumer Electronics Applications | $9.20 |
| TSB42AB4 | 3.3 | 400 | 8 | 128-TQFP | 1394 Link Layer Controller for Consumer Electronics Applications – No Content Protection | $10.95 |
| TSB42AC3 | 3.3 | 400 | 10 | 100-TQFP | High-Performance Link Layer with 32-Bit I/F. May Be Cycle Master; Has 10kb FIFO and JTAG Support. PHY-Link Timing Compliant with 1394a-2000 for Industrial and Bridge Applications. | $6.50 |
| TSB82AA2 | 3.3 | 800 | 11 | 144-LQFP | High-Performance 1394b 3.3V OHCI 1.1+ Compliant Link Layer Controller | $7.80 |

[1] *推荐零售价为每1000片时的美元价格。*

### 1394集成器件选择指南

| Device | Supply Voltage (V) | Speed Max (Mbps) | FIFO (kb) | Package(s) | Description | Price[1] |
|---|---|---|---|---|---|---|
| TSB43AA22 | 3.3 | 400 | 8 | 128-TQFP | 1394a Serial Layer Controller +400Mbps, 2-Port Physical Layer | $7.20 |
| TSB43AA82A | 3.3 | 400 | 4.7 | 144-LQFP | 2-Port High Performance Integrated Physical and Link Layer Chip for PC Peripherals | $8.30 |
| TSB43AB21A | 3.3 | 400 | 9 | 128-TQFP | OHCI 1.1, 1394a Link Layer Controller Integrated with 1394a, 400Mbps, 1-Port Physical Layer (PHY) | $4.35 |
| TSB43AB22A | 3.3 | 400 | 9 | 128-TQFP | OHCI 1.1, 1394a Link Layer Controller Integrated with 1394a, 400Mbps, 2-Port Physical Layer (PHY) | $4.55 |
| TSB43AB23 | 3.3 | 400 | 9 | 144-LQFP, 128-TQFP | OHCI 1.1, 1394a Link Layer Controller Integrated with a 1394a, 400Mbps, 3-Port Physical Layer (PHY) | $4.90 |
| TSB43CA42 | 3.3 | 400 | 16 | 176-LQFP | iceLynx Micro 2-port IEEE 1394a-2000 CES | $10.60 |
| TSB43CA43A | 3.3 | 400 | 16.5 | 176-LQFP | iceLynx Micro-5C with Streaming Audio and Content Protection | $12.60 |
| TSB43CB43A | 3.3 | 400 | 16.5 | 176-LQFP | iceLynx Micro with Streaming Audio | $11.40 |

[1] *推荐零售价为每1000片时的美元价格。*

### 1394物理层控制器选择指南

| Device | Supply Voltage (V) | Speed Max (Mbps) | FIFO (kb) | Package(s) | Description | Price[1] |
|---|---|---|---|---|---|---|
| TSB14AA1A | 3.3 | 100 | 1 | 48-TQFP | IEEE 1394-1995, 3.3V, 1-Port, 50/100Mbps, Backplane PHY | $5.90 |
| TSB14C01A | 5 | 100 | 1 | 64-LQFP | IEEE 1394-1995, 5V, 1-Port, 50/100Mbps Backplane Physical Layer Controller | $5.45 |
| TSB17BA1 | 3.3 | 100 | 1 | 24-TSSOP | 1394b-2002 Compliant Cat5 Cable Transceiver for up to 100 Meters | $2.50 |
| TSB41AB1 | 3.3 | 400 | 1 | 48-HTQFP, 64-HTQFP | IEEE 1394a One-Port Cable Transceiver/Arbiter | $1.50 |
| TSB41AB2 | 3.3 | 400 | 2 | 64-HTQFP | IEEE 1394a Two-Port Cable Transceiver/Arbiter | $1.85 |
| TSB41AB3A | 3.3 | 400 | 3 | 80-HTQFP | IEEE 1394a Three-Port Cable Transceiver/Arbiter | $3.00 |
| TSB41BA3A | 3.3 | 400 | 3 | 80-HTQFP | 1394b-2002 3-Port Physical Layer Device | $6.50 |
| TSB41LV04A | 3.3 | 400 | 4 | 80-HTQFP | IEEE 1394a Four-Port Cable Transceiver/Arbiter | $6.50 |
| TSB41LV06A | 3.3 | 400 | 6 | 100-HTQFP | IEEE 1394a Six-Port Cable Transceiver/Arbiter | $6.40 |
| TSB81BA3 | 1.8, 3.3 | 800 | 3 | 80-HTQFP | IEEE P1394b s800 Three-Port Cable Transceiver/Arbiter | $7.80 |

[1] *推荐零售价为每1000片时的美元价格。*



## UARTs选择指南

| Device | Channels | FIFOs (Bytes) | Baud Rate max (Mbps) | Voltage (V) | Package(s) | Description | Price[1] |
|---|---|---|---|---|---|---|---|
| TL16C450 | 1 | 0 | 0.256 | 5 | 40-PDIP, 44-PLCC | Single UART without FIFO | $1.50 |
| TL16C451 | 1 | 0 | 0.256 | 5 | 68-PLCC | Single UART with Parallel Port and without FIFO | $2.50 |
| TL16C452 | 2 | 0 | 0.256 | 5 | 68-PLCC | Dual UART with Parallel Port and without FIFO | $2.55 |
| TL16C550C | 1 | 16 | 1 | 5, 3.3 | 48-LQFP, 40-PDIP, 44-PLCC, 48-TQFP | Single UART with 16-Byte FIFOs and Auto Flow Control | $1.75 |
| TL16C550D | 1 | 16 | 1 | 5, 3.3, 2.5 | 48-LQFP, 48-TQFP, 32-QFN | Single UART with 16-Byte FIFOs and Auto Flow Control | $1.75 |
| TL16C552/552A | 2 | 16 | 1 | 5 | 68-PLCC | Dual UART with 16-Byte FIFOs and Parallel Port | $3.90 /$3.85 |
| TL16C554/554A | 4 | 16 | 1 | 5 | 80-LQFP, 68-PLCC | Quad UART with 16-Byte FIFOs | $6.05/$6.00 |
| TL16C750 | 1 | 16 or 64 | 1 | 5, 3.3 | 64-LQFP, 44-PLCC | Single UART with 64-Byte FIFOs, Auto Flow Control, Low-Power Modes | $3.70 |
| TL16C752B | 2 | 64 | 3 | 3.3 | 48-LQFP | Dual UART with 64-Byte FIFO | $3.10 |
| TL16C754B | 4 | 64 | 5V-3, 3.3V-2 | 5, 3.3 | 80-LQFP, 68-PLCC | Quad UART with 64-Byte FIFO | $8.35 |
| TL16PC564B/BLV | 1 | 64 | 1 | 5, 3.3 | 100-BGA, 100-LQFP | Single UART with 64-Byte FIFOs, PCMCIA Interface | $5.90/$3.10 |
| TL16PIR552 | 2 | 16 | 1 | 5 | 80-QFP | Dual UART with 16-Byte FIFOs, Selectable IR and 1284 Modes | $6.10 |
| TIR1000 | 0 | None | 0.115 | 2.7 to 5.5 | 8-OP, 8-TSSOP | Standalone IrDA Encoder and Decoder | $1.15 |
| TUSB3410 | 0 | None | 0.922 | 3.3 | 32-LQFP | RS232/IrDA Serial-to-USB Converter | $2.50 |

[1] 推荐零售价为每1000片时的美元价格。

## USB集线器控制器选择指南

| Device | Speed | Ports | $I^2C$ | Voltage (V) | Package | Description | Price[1] |
|---|---|---|---|---|---|---|---|
| TUSB2036 | Full (1.1) | 2 | No | 3.3 | 32-LQFP | 2/3-Port Hub for USB with Optional Serial EEPROM Interface | $1.15 |
| TUSB2046B | Full (1.1) | 4 | No | 3.3 | 32-LQFP | 4-Port Hub for USB with Optional Serial EEPROM Interface Supporting Windows® 95/DOS Mode | $1.20 |
| TUSB2077A | Full (1.1) | 7 | No | 3.3 | 48-LQFP | 7-Port USB Hub with Optional Serial EEPROM Interface | $1.95 |
| TUSB2136 | Full (1.1) | 2 | Yes | 3.3 | 64-LQFP | 2-Port Hub with Integrated General-Purpose Function Controller | $3.25 |
| TUSB5052 | Full (1.1) | 5 | Yes | 3.3 | 100-LQFP | 5-Port Hub with Integrated Bridge to Two Serial Ports | $5.10 |

[1] 推荐零售价为每1000片时的美元价格。

## USB外设选择指南

| Device | Speed | Voltage (V) | Remote Wakeup | Package | Description | Price[1] |
|---|---|---|---|---|---|---|
| TUSB3210 | Full | 3.3 | Yes | 64-LQFP | USB Full-Speed General-Purpose Device Controller | $2.50 |
| TUSB3410 | Full | 3.3 | Yes | 32-LQFP | RS232/IrDA Serial-to-USB Converter | $2.25 |
| TUSB6250 | Full, high | 3.3 | Yes | 80-TQFP | USB 2.0 High-Speed ATA/ATAPI Bridge Solution | $2.80 |

[1] 推荐零售价为每1000片时的美元价格。

## PCI桥接器选择指南

| Device | Intel Compatible Part Number | Speed (MHz) | Expansion Interface (Bits) | Hot Swap | MicroStar BGA™ Packaging | Voltage(s) (V) | Package(s) | Description | Price[1] |
|---|---|---|---|---|---|---|---|---|---|
| HPC3130 | | 33 | 32 | | No | 3.3 | 128-LQFP, 120-QFP | Hot Plug Controller | $10.95 |
| HPC3130A | | 66 | 64 | | No | 3.3 | 128-LQFP, 144-LQFP, 120-QFP | Hot Plug Controller | $10.95 |
| PCI2040 | | | | Friendly | Yes | 3.3, 5 | 144-BGA, 144-LQFP | PCI-to-DSP Bridge Controller, Compliant to Compact PCI Hot Swap Specification 1.0 | $10.55 |
| PCI2060 | | 66 | 32 | Friendly | Yes | 3.3, 5 | 257-BGA | Asynchronous 32-Bit, 66MHz PCI-to-PCI Bridge | $9.50 |
| PCI2050B | 21150bc | 66 | 32 | Friendly | Yes | 3.3, 5 | 257-BGA, 208-LQFP, 208-QFP | PCI-to-PCI Bridge | $9.50 |
| PCI2250 | 21152ab | 33 | 32 | Friendly | No | 3.3, 5 | 176-LQFP, 160-QFP | 32-Bit, 33MHz PCI-to-PCI Bridge, Compact PCI Hot-Swap Friendly, 4-Master | $6.10 |

[1] 推荐零售价为每1000片时的美元价格。



## 接口/供电及控制

### PCI卡总线控制器选择指南

| Device | Voltage (V) | D3 Cold Wake | Integrated 1394 | Integrated ZV | Package(s) | Description | Price[1] |
|---|---|---|---|---|---|---|---|
| PCI1510 | 3.3 | Yes | No | No | 144-BGA, 144-LQFP | Single Slot PC CardBus Controller | $3.60 |
| PCI1520 | 3.3 | Yes | No | No | 209-BGA, 208-LQFP | PC Card Controller | $4.35 |
| PCI1620 | 1.8, 3.3, 5 | Yes | No | No | 209-BGA, 208-LQFP | PC Card, Flash Media, and Smart Card Controller | $7.35 |
| PCI4510 | 3.3 | Yes | Yes | No | 209-BGA, 208-LQFP | PC Card and Integrated 1394a-2000 OHCI Two-Port-PHY/Link-Layer Controller | $8.00 |
| PCI4520 | 3.3 | Yes | Yes | No | 257-BGA | Two Slot PC Card and Integrated 1394a-2000 OHCI Two-Port-PHY/Link-Layer Controller | $9.15 |
| PCI6420 | 3.3 | Yes | No | No | 288-BGA | Integrated 2-Slot PC Card and Dedicated Flash Media Controller | $9.50 |
| PCI6620 | 3.3 | Yes | No | No | 288-BGA | Integrated 2-Slot PC Card with Smart Card and Dedicated Flash Media Controller | $10.50 |
| PCI7410 | 3.3 | Yes | Yes | No | 209-BGA, 208-LQFP | PC Card, Flash Media, Integrated 1394a-2000 OHCI 2-Port PHY/Link-Layer Controller | $11.00 |
| PCI7420 | 3.3 | Yes | Yes | No | 288-BGA | Integrated 2-Slot PC Card, Dedicated Flash Media Socket & 1394a-2000 OHCI 2-Port-PHY/Link-Layer Controller | $12.00 |
| PCI7510 | 3.3 | Yes | Yes | No | 209-BGA, 208-LQFP | Integrated PC Card, Smart Card and 1394 Controller | $11.00 |
| PCI7610 | 3.3 | Yes | Yes | No | 209-BGA, 208-LQFP | Integrated PC Card, Smart Card, Flash Media ,1394a-2000 OHCI 2-Port-PHY/ Link-Layer Controller | $12.00 |
| PCI7620 | 3.3 | Yes | Yes | No | 288-BGA | Integrated 2-Slot PC Card with Smart C, Flash Media, 1394a-2000 OHCI 2-Port-PHY/Link-Layer Controller | $13.00 |

[1] 推荐零售价为每1000片时的美元价格。

### Power+ Logic™: 具有集成控制逻辑及FETs的8位器件(TC= -40°C至 +125°C)

| Device | Description | $V_{DS}$ max (V) | $I_{CC}$ typ (µA) | $I_O$ (A) | $I_{PEAK}$ (A) | $r_{DS(on)}$ typ (Ω) | $E_{AS}$ max (mJ) | $t_{PLH}$ typ (ns) | ESD max (kV) | Package(s) |
|---|---|---|---|---|---|---|---|---|---|---|
| TPIC6259 | Addressable Latch | 45 | 15 | 0.25 | 0.75 | 1.3 | 75 | 625 | 3 | 20/SOP (DW), DIP (N) |
| TPIC6273 | D-Type Latch | 45 | 15 | 0.25 | 0.75 | 1.3 | 75 | 625 | 3 | 20/SOP (DW), DIP (N) |
| TPIC6595 | Shift Register | 45 | 15 | 0.25 | 0.75 | 1.3 | 75 | 650 | 3 | 20/SOP (DW), DIP (N) |
| TPIC6596 | Shift Register | 45 | 15 | 0.25 | 0.75 | 1.3 | 75 | 650 | 3 | 20/SOP (DW), DIP (N) |
| TPIC6A259[1] | Addressable Latch | 50 | 500 | 0.35 | 1.1 | 1 | 75 | 125 | 2.5 | 20/DIP (NE), 24/SOP (DW) |
| TPIC6A595[1] | Shift Register | 50 | 500 | 0.35 | 1.1 | 1 | 75 | 125 | 2.5 | 20/DIP (NE), 24/SOP (DW) |
| TPIC6A596[1] | Shift Register | 50 | 500 | 0.35 | 1.1 | 1 | 75 | 125 | 2.5 | 20/DIP (NE), 24/SOP (DW) |
| TPIC6B259[2] | Addressable Latch | 50 | 20 | 0.15 | 0.5 | 5 | 30 | 150 | 2.5 | 20/SOP (DW), DIP (N) |
| TPIC6B273[2] | D-Type Latch | 50 | 20 | 0.15 | 0.5 | 5 | 30 | 150 | 2.5 | 20/SOP (DW), DIP (N) |
| TPIC6B595[2] | Shift Register | 50 | 20 | 0.15 | 0.5 | 5 | 30 | 150 | 2.5 | 20/SOP (DW), DIP (N) |
| TPIC6B596[2] | Shift Register | 50 | 20 | 0.15 | 0.5 | 5 | 30 | 150 | 2.5 | 20/SOP (DW), DIP (N) |
| TPIC6C595[2] | Shift Register | 33 | 20 | 0.1 | 0.25 | 7 | 30 | 80 | 2.5 | 16/SOP (D), DIP (N) |
| TPIC6C596[2] | Shift Register | 33 | 20 | 0.1 | 0.25 | 7 | 30 | 80 | 2.5 | 16/SOP (D), DIP (N) |

[1] 短路及电流过载保护。 [2] 具有电流限制功能。

### PWM电源控制（单输出）选择指南

| Device | Typical Power Level (W) | Max Practical Frequency | Start-Up Current | Operating Current | Supply Voltage (V) | UVLO: On/Off (V) | $V_{REF}$ (V) | $V_{REF}$ Tol. (%) | Max Duty Cycle (%) | E/A | Voltage Feed-Forward | Internal Drive (Sink/Source) (A) | Package(s) | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Peak Current Mode Controllers** | | | | | | | | | | | | | | |
| UCC38C40 | 10 to 250 | 1MHz | 50µA | 2.3mA | 6.6 to 20 | 7.0/6.6 | 5 | 2 | 100 | Yes | Yes | 1/1 | SOIC-8, PDIP-8, MSOP-8 | $0.95 |
| UCC38C41 | 10 to 250 | 1MHz | 50µA | 2.3mA | 6.6 to 20 | 7.0/6.6 | 5 | 2 | 50 | Yes | Yes | 1/1 | SOIC-8, PDIP-8, MSOP-8 | $0.95 |
| UCC38C42 | 10 to 250 | 1MHz | 50µA | 2.3mA | 9 to 20 | 14.5/9 | 5 | 2 | 100 | Yes | Yes | 1/1 | SOIC-8, PDIP-8, MSOP-8 | $0.95 |
| UCC38C43 | 10 to 250 | 1MHz | 50µA | 2.3mA | 7.6 to 20 | 8.4/7.6 | 5 | 2 | 100 | Yes | Yes | 1/1 | SOIC-8, PDIP-8, MSOP-8 | $0.95 |
| UCC38C44 | 10 to 250 | 1MHz | 50µA | 2.3mA | 9 to 20 | 14.5/9 | 5 | 2 | 50 | Yes | Yes | 1/1 | SOIC-8, PDIP-8, MSOP-8 | $0.95 |
| UCC38C45 | 10 to 250 | 1MHz | 50µA | 2.3mA | 7.6 to 20 | 8.4/7.6 | 5 | 2 | 50 | Yes | Yes | 1/1 | SOIC-8, PDIP-8, MSOP-8 | $0.95 |

[1] 推荐零售价为每1000片时的美元价格。



## 开关式DC/DC控制器选择指南

| Device | $V_{IN}$ (V) | $V_O$ (V) (max) | $V_O$ (V) (min) | $V_{REF}$ Tol (%) | Driver Current (A) | Output Current (A)[2] | Multiple Outputs | Frequency (kHz) | Protection[3] OPC | OVP | UVLO | PG | Application[4] Source Only | Source/ Sink | Prebias Operation | PGD | DDR | Light Load Efficient | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **General-Purpose DC/DC Controllers** | | | | | | | | | | | | | | | | | | | |
| TPS40007 | 2.25 to 5.5 | 4 | 0.7 | 1.5 | 1 | 15 | No | 300 | ✓ | — | ✓ | — | — | ✓ | ✓ | ✓ | — | ✓ | $0.99 |
| TPS40021 | 2.25 to 5.5 | 4 | 0.7 | 1 | 2 | 25 | No | Program up to 1MHz | ✓ | — | ✓ | ✓ | — | ✓ | — | ✓ | — | ✓ | $1.15 |
| TPS40057 | 8 to 40 | 35 | 0.7 | 1 | 1 | 20 | No | Program up to 1MHz | ✓ | — | ✓ | — | — | — | ✓ | — | — | ✓ | $1.35 |
| TPS40061 | 10 to 55 | 40 | 0.7 | 1 | 1 | 10 | No | Program up to 1MHz | ✓ | — | ✓ | — | — | ✓ | — | — | — | — | $1.40 |
| TPS40071 | 4.25 to 28 | 23 | 0.7 | 1 | 1 | 20 | No | Program up to 1MHz | ✓ | — | ✓ | ✓ | — | ✓ | — | ✓ | — | — | $1.35 |
| TPS51020 | 4.25 to 28 | 24 | 0.85 | 1 | 2 | 20 | 2 | 450 | ✓ | ✓ | ✓ | ✓ | — | — | — | — | ✓ | ✓ | $3.15 |
| **DC/DC Controllers with Light Load Efficiency** | | | | | | | | | | | | | Comments | | | | | | |
| TPS51116 | 3 to 28 | 3.4 | 1.5 | 1 | 0.8 | 10 | 1 + 2 | Up to 500 | ✓ | ✓ | ✓ | ✓ | Sync Switcher w/3A Tracking LDO | | | | ✓ | ✓ | $1.20 |
| **Other Topology DC/DC Controllers** | | | | | | | | | | | | | Comments | | | | | | |
| TPS6420x | 1.8 to 6.5 | 6.5 | 1.2 | — | — | 3 | No | — | ✓ | — | ✓ | — | Simple, Hysteretic High-Efficiency Controller in SOT-23 | | | | | | $0.55 |
| UC3572 | 4.75 to 30 | 0 | –48 | 2 | 0.5 | 5 | No | 300 | ✓ | — | ✓ | — | Simple Inverting PWM Controller | | | | | | $1.05 |

[1] 推荐零售价为每1000片时的美元价格。 [2] 可支持此量级电流电平.。
[3] OCP = 过电流保护；OVP=过电压保护；UVLO =低压锁定；PG =供电良好。
[4] 所选用的器件为发送/接收版本，可用于距大多数的应用，可做二象限（two-quadrant）操作并发送或接收输出电流。
PGD = 包括预测门驱动技术。DDR =支持DDR内存。

## DC/DC转换器（集成FETs）选择指南

| Device | $V_{IN}$ (V) | Output Current (A) | $V_{OUT}$ (V) | Package(s) | Price[1] |
|---|---|---|---|---|---|
| **Buck (Step Down)** | | | | | |
| TPS62200/1/2/3/4/5/6 | 2.5 to 6.0 | 0.3 | Adj.,1.5, 1.8, 3.3, 1.6, 2.5, 2.6 | SOT 23-5 | $1.35 |
| TPS62000/1/2/3/4/5/6/7/8 | 2.0 to 5.5 | 0.6 | Adj., 0.9, 1.0,1.2, 1.5, 1.8, 2.5, 3.3, 1.9 | MSOP-10 | $1.60 |
| TPS62051/2/3/4/5 | 2.7 to 10 | 0.8 | Adj., 1.5, 1.8, 3.3 | MSOP-10 | $1.85 |
| TPS62040/2/3/4/6 | 2.5 to 6.0 | 1.2 | Adj. 1.5, 1.6, 1.8, 3.3 | MSOP-10, QFN-10 | $2.20 |
| TPS62110/1/2 | 3.1 to 17 | 1.5 | Adj., 3.3, 5 | QFN-16 | $2.50 |
| TPS54310/1/2/3/4/5/6 | 3.0 to 6.0 | 3 | Adj., 0.9, 1.2, 1.5, 1.8, 2.5, 3.3 | HTSSOP-20 | $2.95 |
| TPS54610/1/2/3/4/5/6 | 3.0 to 6.0 | 6 | Adj., 0.9, 1.2, 1.5, 1.8, 2.5, 3.3 | HTSSOP-28 | $3.90 |
| TPS54810 | 4.0 to 6.0 | 8 | Adj. to 0.9 | HTSSOP-28 | $4.20 |
| TPS54910 | 3.0 to 4.0 | 9 | Adj. to 0.9 | HTSSOP-28 | $4.40 |
| TPS799xx | 1.2 to 3.3 | 0.2 | Adj tp 6.5 | SOT23-5 | 0.35 |
| **Inverter** | | | | | |
| TPS6755 | 2.7 to 9.0 | 0.2 | Adj. from -1.25 to - 9.3 | SOIC-8 | $1.25 |
| TL497A | 4.5 to 12 | 0.5 | Adj. from -1.2 to -25 | TSSOP-14 | $0.86 |

[1] 推荐零售价为每1000片时的美元价格。



## 电源管理

## 低压差稳压器 (LDOs)选择指南

| Device | $I_O$ (mA) | $V_{DO}$ @ $I_O$ (mV) | $I_q$ (µA) | Output Options: Voltage (V) | Output Options: Adj. | Min $V_{IN}$ | Max $V_{IN}$ | Accuracy (%) | SC70 | SOT23 | MSOP | SO8 | SOT223 | TO220 | QFN | DDPAK | Features[2] | CO[3] | Comments | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Positive Voltage, Single-Output Devices** | | | | | | | | | | | | | | | | | | | | |
| TPS797xx | 10 | 105 | 1.2 | 1.8, 3.0, 3.3 | — | 1.8 | 5.5 | 4 | ✓ | | | | | | | | PG | 0.47µF C | MSP430; Lowest Iq | $0.34 |
| TPS715xx/A | 50 | 415 | 3.2 | 2.5, 3.0, 3.3, 5 | 1.2 – 15 | 2.5 | 24 | 4 | ✓ | | | | | | ✓ | | | 0.47µF C | $V_{IN}$ Up to 24V | $0.34 |
| TPS722xx | 50 | 50 | 80 | 1.5, 1.6, 1.8 | 1.2 – 2.5 | 1.8 | 5.5 | 3 | | ✓ | | | | | | | /EN, BP | 0.1µF C | Low Noise, $V_{IN}$ Down to 1.8V | $0.41 |
| REG101 | 100 | 60 | 400 | 2.5, 2.8, 2.85, 3.0, 3.3, 5 | 2.5 – 5.5 | 2.6 | 10 | 1.5 | | ✓ | | ✓ | | | | | EN, BP | No Cap | Low Noise | $0.95 |
| TPS792xx | 100 | 38 | 185 | 2.5, 2.8, 3.0 | 1.2 – 5.5 | 2.7 | 5.5 | 2 | | ✓ | | | | | | | EN | 1µF C | RF Low Noise, High PSRR | $0.40 |
| TPS731xx | 150 | 30 | 400 | 1.5, 1.8, 2.5, 3.0, 3.3, 5.0, EEProm[4] | 1.2 – 5.5 | 1.7 | 5.5 | 1 | | ✓ | | | | | | | EN, BP | No Cap | Reverse Leakage Protection | $0.45 |
| TPS771xx | 150 | 75 | 90 | 1.5, 1.8, 2.7, 2.8, 3.3, 5 | 1.5 – 5.5 | 2.7 | 10 | 2 | | | | ✓ | | | | | /EN, SVS | 10µF C | Low Noise | $0.60 |
| TPS732xx | 250 | 40 | 400 | 1.5, 1.8, 2.5, 3.0 3.3, 5.0, EEProm[4] | 1.2 – 5.5 | 1.7 | 5.5 | 1 | | ✓ | | | ✓ | | | | EN, BP | No Cap | Reverse Leakage Protection | $0.65 |
| TPS794xx | 250 | 145 | 172 | 1.8, 2.5, 2.8, 3.0, 3.3 | 1.2 – 5.5 | 2.7 | 5.5 | 2 | | | ✓ | | ✓ | | | | EN, BP | 2.2µF C | RF Low Noise, High PSRR | $0.65 |
| REG102 | 250 | 150 | 400 | 2.5, 2.8, 2.85, 3.0, 3.3, 5 | 2.5 – 5.5 | 1.8 | 10 | 2 | | ✓ | | ✓ | ✓ | | | | EN, BP | No Cap | Capacitor Free, DMOS | $1.05 |
| TPS736xx | 400 | 75 | 300 | 1.5, 1.8, 2.5, 3.0 3.3, EEProm[4] | 1.2 – 5.5 | 1.7 | 5.5 | 1 | | ✓ | | | ✓ | | ✓ | | EN, BP | No Cap | Reverse Leakage Protection | $0.85 |
| TPS795xx | 500 | 105 | 265 | 1.6, 1.8, 2.5, 3.0, 3.3 | 1.2 – 5.5 | 2.7 | 5.5 | 3 | | | | | ✓ | | | | EN, BP | 2.2µF C | RF Low Noise, High PSRR | $1.05 |
| REG103 | 500 | 115 | 500 | 2.5, 2.7, 3.0, 3.3, 5 | 2.5 – 5.5 | 2.1 | 15 | 2 | | | | ✓ | ✓ | | | ✓ | EN, PG | No Cap | Capacitor Free, DMOS | $2.50 |
| TPS777xx | 750 | 260 | 85 | 1.5, 1.8, 2.5, 3.3 | 1.5 – 5.5 | 2.7 | 10 | 2 | | | ✓ | | ✓ | | | | /EN,SVS | 10µF T | Fast Transient Response | $1.05 |
| TPS725xx | 1000 | 170 | 75 | 1.5, 1.6, 1.8, 2.5 | 1.2 – 5.5 | 1.8 | 6 | 2 | | | | ✓ | ✓ | | | ✓ | EN, SVS | No Cap | $V_{IN}$ Down to 1.8V, Low Noise | $1.10 |
| TPS786xx | 1500 | 390 | 310 | 1.8, 2.5, 2.8, 3.0, 3.3 | 1.2 – 5.5 | 2.7 | 5.5 | 3 | | | | | ✓ | | | ✓ | EN, BP | 1µF C | RF Low Noise, High PSRR | $1.35 |
| UCCx83-x | 3000 | 400 | 400 | 3.3, 5 | 1.2 – 8.5 | 1.8 | 9 | 2.5 | | | | | | ✓ | | ✓ | EN | 22µF T | Reverse Leakage Protection | $2.57 |
| UCx85-x | 5000 | 350 | 8mA | 1.5, 2.1, 2.5 | 1.2 – 6 | 1.7 | 7.5 | 1 | | | | | | ✓ | | ✓ | | 100µF T | Fast LDO with Reverse Leak | $3.00 |
| **Negative Voltage, Single-Output Devices** | | | | | | | | | | | | | | | | | | | | |
| TPS723xx | 200 | 280 | 130 | –2.5 | –1.2 to –9 | –10 | –2.7 | 2 | | ✓ | | | | | | | EN, BP | 2.2µF C | Low Noise, High PSRR | $1.05 |
| UCC384-x | 500 | 150 | 200 | –12.0, –5.0 | –1.25 to –1 | –15 | –3.5 | 3 | | | | ✓ | | | | | /EN | 4.7µF T | Duty Cycled Short | $1.86 |

[1] 推荐零售价为每1000片时的美元价格。
[2] PG =供电良好； EN =激活高位使能； /EN =激活低位使能； SVS=电源电压监控； BP =噪声抑制电容旁通引脚 。
[3] C = 陶瓷； T =钽； No Cap =无电容LDO。
[4] TI's TPS73xxx系列LDOs可在出厂前对EEProm实行编程， 可根据客户订制的电压（也可使客户订制的电流限制）及最小订货量进行生产。如有需要请与TI取得联系。

## 双输出LDOs选择指南

| Device | $I_{O1}$ (mA) | $I_{O2}$ (mA) | $V_{DO1}$ at $I_{O1}$ (mV) | $V_{DO2}$ at $I_{O2}$ (mV) | $I_Q$ at $I_O$ (µA) | Output Options: Voltage (V) | Output Options: Adj. | Accuracy (%) | PWP Package | Min $V_O$ | Max $V_O$ | /EN | PG | SVS | Seq | Low Noise | Min $V_{IN}$ | Max $V_{IN}$ | CO[2] | Description | Price[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPS707xx | 250 | 150 | 83 | — | 95 | 3.3/2.5, 3.3/1.8, 3.3/1.5, 3.3/1.2 | ✓ | 2 | ✓ | 1.2 | 5 | ✓ | ✓ | ✓ | ✓ | ✓ | 2.7 | 5.5 | 10µF T | Dual-Output LDO with Sequencing | $1.20 |
| TPS708xx | 250 | 150 | 83 | — | 95 | 3.3/2.5, 3.3/1.8, 3.3/1.5, 3.3/1.2 | ✓ | 2 | ✓ | 1.2 | 5 | ✓ | ✓ | ✓ | | ✓ | 2.7 | 5.5 | 10µF T | Dual-Output LDO with Independent Enable | $1.20 |
| TPS701xx | 500 | 250 | 170 | — | 95 | 3.3/2.5, 3.3/1.8, 3.3/1.5, 3.3/1.2 | ✓ | 2 | ✓ | 1.2 | 5 | ✓ | ✓ | ✓ | ✓ | ✓ | 2.7 | 5.5 | 10µF T | Dual-Output LDO with Sequencing | $1.50 |
| TPS702xx | 500 | 250 | 170 | — | 95 | 3.3/2.5, 3.3/1.8, 3.3/1.5, 3.3/1.2 | ✓ | 2 | ✓ | 1.2 | 5 | ✓ | ✓ | ✓ | | ✓ | 2.7 | 5.5 | 10µF T | Dual-Output LDO with Independent Enable | $1.50 |
| TPS767D3xx | 1000 | 1000 | 230 | — | 170 | 3.3/2.5 3.3/1.8 | ✓ | 2 | ✓ | 1.2 | 5 | ✓ | | ✓ | | | 2.7 | 10 | 10µF T | Dual-Output FAST LDO with Integrated SVS | $2.00 |
| TPPM0110 | 1500 | 300 | 1000 | 2500 | 1000 | 3.3/1.8 | | 2 | | 1.8 | 3.3 | | | | | | 4.7 | 5.3 | 100µF T | Outputs Track within 2V | $1.60 |
| TPPM0111 | 1500 | 300 | 1000 | 2800 | 1000 | 3.3/1.5 | | 2 | | 1.5 | 3.3 | | | | | | 4.7 | 5.3 | 100µF T | Outputs Track within 2V | $1.60 |
| TPS703xx | 2000 | 1000 | 160 | — | 185 | 3.3/2.5, 3.3/1.8, 3.3/1.5, 3.3/1.2 | ✓ | 2 | ✓ | 1.2 | 5 | ✓ | ✓ | ✓ | ✓ | ✓ | 2.7 | 5.5 | 22µF T | Dual-Output LDO with Sequencing | $2.35 |
| TPS704xx | 2000 | 1000 | 160 | — | 185 | 3.3/2.5, 3.3/1.8, 3.3/1.5, 3.3/1.2 | ✓ | 2 | ✓ | 1.2 | 5 | ✓ | ✓ | ✓ | | ✓ | 2.7 | 5.5 | 22µF T | Dual-Output LDO with Independent Enable | $2.35 |

[1] 推荐零售价为每1000片时的美元价格。 [2] T =钽



## 插入式电源解决方案选择指南

| Device | Input Bus Voltage (V) | Description | $P_{OUT}$ or $I_{OUT}$ | Isolated Outputs | $V_O$ Range (V) | $V_O$ Adjustable | Price[1] |
|---|---|---|---|---|---|---|---|
| **Non-Isolated Single Positive Output** | | | | | | | |
| PTH03010W | 3.3 | 3.3V Input 15A POL with Auto-Track™ Sequencing | 15A | No | 0.8 to 2.5 | Yes | $11.60 |
| PTH03020W | 3.3 | 3.3V Input 22A POL with Auto-Track Sequencing | 22A | No | 0.8 to 2.5 | Yes | $18.15 |
| PTH03030W | 3.3 | 3.3V Input 30A POL with Auto-Track Sequencing | 30A | No | 0.8 to 2.5 | Yes | $25.00 |
| PTH03050W | 3.3 | 3.3V Input 6A POL with Auto-Track Sequencing | 6A | No | 0.8 to 2.5 | Yes | $6.90 |
| PTH03060W | 3.3 | 3.3V Input 10A POL with Auto-Track Sequencing | 10A | No | 0.7 to 2.5 | Yes | $9.80 |
| PTH04000W | 3.3/5 | 3V to 5.5V Input 3A POL with Auto-Track Sequencing | 3A | No | 0.9 to 3.6 | Yes | $4.50 |
| PTH04040W | 3.3/5 | 3V to 5.5V Input 60A POL with Auto-Track Sequencing | 60A | No | 0.8 to 3.6 | Yes | $35.00 |
| PTH05010W | 5 | 5V Input 15A POL with Auto-Track Sequencing | 15A | No | 0.8 to 3.6 | Yes | $11.60 |
| PTH05020W | 5 | 5V Input 22A POL with Auto-Track Sequencing | 22A | No | 0.8 to 3.6 | Yes | $18.15 |
| PTH05030W | 5 | 5V Input 30A POL with Auto-Track Sequencing | 30A | No | 0.8 to 3.6 | Yes | $25.00 |
| PTH05050W | 5 | 5V Input 6A POL with Auto-Track Sequencing | 6A | No | 0.8 to 3.6 | Yes | $6.90 |
| PTH05060W | 5 | 5V Input 10A POL with Auto-Track Sequencing | 10A | No | 0.8 to 3.6 | Yes | $9.80 |
| **PTH05T210W** | 5 | 5V Input, 30A T2 2nd Gen PTH POL with *TurboTrans*™ | 30A | No | 0.7 to 3.6 | Yes | $18.00 |
| PTH08080W | 5/12 | 5V to 18V Input, 2.25A POL | 2.25A | No | 0.9 to 5.5 | Yes | $4.28 |
| **PTH08T210W** | 12 | 5.5 to 14V Input, 30A T2 2nd Gen PTH POL with *TurboTrans* | 30A | No | 0.7 to 3.6 | Yes | $18.00 |
| **PTH08T220W** | 5/12 | 4.5 to 14V Input, 16A T2 2nd Gen PTH POL with *TurboTrans* | 16A | No | 0.7 to 5.5 | Yes | $12.60 |
| **PTH08T230W** | 5/12 | 4.5 to 14V Input, 6A T2 2nd Gen PTH POL with *TurboTrans* | 6A | No | 0.7 to 5.5 | Yes | $7.90 |
| **PTH08T240W** | 5/12 | 4.5 to 14V Input, 10A T2 2nd Gen PTH POL with *TurboTrans* | 10A | No | 0.7 to 5.5 | Yes | $10.80 |
| PTH12010L/W | 12 | 12V Input 12A POL with Auto-Track Sequencing | 12A | No | 0.8 to 1.8/1.2 to 5.5 | Yes | $11.60 |
| PTH12020L/W | 12 | 12V Input 18A POL with Auto-Track Sequencing | 18A | No | 0.8 to 1.8/1.2 to 5.5 | Yes | $18.15 |
| PTH12030L/W | 12 | 12V Input 26A POL with Auto-Track Sequencing | 26A | No | 0.8 to 1.8/1.2 to 5.5 | Yes | $25.00 |
| PTH12040W | 12 | 12V Input 50A POL with Auto-Track Sequencing | 50A | No | 0.8 to 5.5 | Yes | $35.00 |
| PTH12050L/W | 12 | 12V Input 6A POL with Auto-Track Sequencing | 6A | No | 0.8 to 1.8/1.2 to 5.5 | Yes | $6.90 |
| PTH12060L/W | 12 | 12V Input 10A POL with Auto-Track Sequencing | 10A | No | 0.8 to 1.8/1.2 to 5.5 | Yes | $9.80 |
| PTN04050C | 3.3/5 | 3V/5V Input, 12W Output Step-Up (Boost) ISR | 12W | No | 5 to 15 | Yes | $8.00 |
| PTN78000W/H | $V_O$ + 2 to 36 | Wide-Input, Wide-Output 1.5A Positive Step-Down ISR | 1.5A | No | 2.5 to 12/12 to 22 | Yes | $8.00 |
| PTN78060W/H | $V_O$ + 2 to 36 | Wide-Input, Wide-Output 3A Positive Step-Down ISR | 3A | No | 2.5 to 12/12 to 22 | Yes | $11.00 |
| PTN78020W/H | $V_O$ + 2 to 36 | Wide-Input, Wide-Output 6A Positive Step-Down ISR | 6A | No | 2.5 to 12/12 to 22 | Yes | $15.00 |
| **Non-Isolated Single Negative Output** | | | | | | | |
| PT6910 | 3.3/5 | 3.3V/5V Input 12W Adjustable Plus-to-Minus Voltage Converter | 12W | No | –1.2 to –6.5 | Yes | $26.25 |
| PTN04050A | 3.3/5 | 3V to 5V Input, 6W Positive to Negative (Buck-Boost) ISR | 6 W | No | –3.3 to –15 | Yes | $8.00 |
| PTN78000A | 7 to 29 | Wide-Input, Wide-Output 1.5A Positive to Negative (Buck-Boost) ISR | 1.5A | No | –3 to –15 | Yes | $8.00 |
| PTN78060A | 9 to 29 | Wide-Input, Wide-Output 15W Positive to Negative (Buck-Boost) ISR | 15W | No | –3 to –15 | Yes | $11.00 |
| PTN78020A | 9 to 29 | Wide-Input, Wide-Output 25W Positive to Negative (Buck-Boost) ISR | 25W | No | –3 to –15 | Yes | $15.00 |
| **Non-Isolated Multiple Output** | | | | | | | |
| PT5060 | 5 | 5 to ±12/15$V_{OUT}$ 9W Dual Output Adjustable ISR | 9W | No | ±8 to ±20 | Yes | $10.80 |
| PT6980 | 12 | 10A 12V Input Adjustable Dual Output ISR | 10A | No | 1.3 to 3.6 | Yes | $27.40 |
| **Isolated Single Output** | | | | | | | |
| DCP01_B | 5, 24 | 1W Unregulated Isolated DC/DC Converter with Sychronization | 1W | Yes | 5, 12, 15 | No | $5.35 |
| DCP02 | 5, 12, 24 | 2W Unregulated Isolated DC/DC Converter with Sychronization | 2W | Yes | 3.3, 5, 7, 9, 12, 15 | No | $6.95 |
| DCR01 | 5, 12, 24 | 1W Regulated Isolated DC/DC Converter with Sychronization | 1W | Yes | 3.3, 5 | No | $5.95 |
| DCR02 | 12, 24 | 2W Regulated Isolated DC/DC Converter with Sychronization | 2W | Yes | 5 | No | $7.30 |
| DCV01 | 5, 24 | 1W Unregulated Isolated DC/DC Converter with 1500V Isolation | 1W | Yes | 5, 12, 15 | No | $8.50 |
| PT4140 | 24 | 20W, 24V Input Isolated DC/DC Converter | 20W | Yes | 1.7 to 16.5 | Yes | $32.45 |
| PT4240 | 24 | 10W, 24V Input Isolated DC/DC Converter | 10W | Yes | 1.5 to 12 | Yes | $26.90 |
| PTB78520W | 18 to 60 | 20A, 18V to 60V Input Isolated POL Converter with Track I/O | 65W | Yes | 1.8 to 3.6 | Yes | $62.00 |
| PTB78560A/B/C | 18 to 60 | 30W, 18V to 60V Input Isolated POL Converter with Track I/O | 30W | Yes | 3.3, 5, 12 | Yes | $25.00 |
| **PTMA** | 48 | 10W, 48V Input Isolated DC/DC Converter - Industry Std Footprint | 10W | Yes | 3.3, 5, 12 | Yes | $20.00 |
| **Isolated Multiple Output** | | | | | | | |
| DCP01_DB | 5, 15, 24 | 1W Unregulated Dual Isolated DC/DC Converter with Sychronization | 1W | Yes | ±5, ±12, ±15 | No | $5.90 |
| DCP02_D | 5, 15, 24 | 2W Unregulated Dual Isolated DC/DC Converter with Sychronization | 2W | Yes | ±5, ±12, ±15 | No | $6.95 |
| DCV01_D | 5, 15, 24 | 1W Unregulated Dual Isolated DC/DC Converter with 1500V Isolation | 1W | Yes | ±5, ±12, ±15 | No | $9.05 |

[1] 推荐零售价为每1000片时的美元价格。

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## 标准线性及逻辑器件选择指南

| Amplifiers and Comparators |
|---|
| LM224K |
| LM248 |
| LM258 |
| LM2902K |
| LM2904 |
| LM318 |
| LM324K |
| LMV321 |
| LMV324 |
| LMV341 |
| LMV342 (Preview) |
| LMV344 (Preview) |
| LMV358 |
| LMV710 |
| LMV711 |
| LMV821 |
| LMV822 |
| LMV824 |
| LMV931 |
| LMV932 |
| LMV934 (Preview) |
| LMV981 |
| LMV982 |
| LT1013DI |
| LT1014DI |
| MC33078 |
| OP27 |
| TL031I |
| TL032I |
| TL034I |
| TL051I |
| TL052I |
| TL054I |
| TL5580I |
| TSM104W |
| TSM104WA |
| **Analog Switches** |
| MAX4594 |
| MAX4595 |
| MAX4596 |
| MAX4597 |
| TS5A23166 |
| TS5A3159 |

| I²C Interface |
|---|
| PCA8550 |
| PCA9306 |
| PCF8574 |
| PCF8574A |
| PCF8575 |
| PCF8575C |
| **Power Management** |
| LM237 |
| LM337 |
| LM4040 |
| LM4041 |
| LP2981 |
| LP2985 |
| MC33063A |
| MC79L12 |
| MC79L12A |
| MC79L15 |
| MC79L15A |
| TL2842 |
| TL2843 |
| TL2844 |
| TL2845 |
| TL431B |
| TL432B |
| TL497A |
| TL594 |
| TL750L10 |
| TL750L12 |
| TL751L10 |
| TL751L12 |
| TL780-12 |
| TL780-15 |
| TLV1117 |
| TLVH431B |
| TLVH432B |
| UA723 |
| UA7810 |
| UA7812 |
| UA7815 |
| UA7824 |
| UA78L09A |
| UA78L10A |
| UA78L12A |
| UA78M09 |
| UA78M10 |
| UA78M12 |

| RS-232 Interface |
|---|
| MAX202 |
| MAX207 |
| MAX208 |
| MAX211 |
| MAX211E |
| MAX222 |
| MAX232 |
| MAX3221 |
| MAX3222 |
| MAX3223 |
| MAX3232 |
| MAX3238 |
| MAX3238-Q1 |
| MAX3243 |
| MAX3243E |
| SN65C1154 |
| SN65C1406 |
| SN65C23243 |
| SN65C3221 |
| SN65C3222 |
| SN65C3223 |
| SN65C3232 |
| SN65C3238 |
| SN65C3243 |
| **RS-485 Interface** |
| SN65175 |
| SN65176B |
| SN65ALS176 |
| SN65ALS180 |

| Translation |
|---|
| SN74ALVC164245 |
| SN74AVC16T245 |
| SN74AVC1T45 |
| SN74AVC20T245 |
| SN74AVC24T245 |
| SN74AVC2T45 |
| SN74AVC32T245 |
| SN74AVC4T245 |
| SN74AVC8T245 |
| SN74AVCA164245 |
| SN74AVCAH164245 |
| SN74AVCB164245 |
| SN74AVCB324245 |
| SN74AVCBH164245 |
| SN74AVCBH324245 |
| SN74AVCH20T245 |
| SN74AVCH32T245 |
| SN74AVCH8T245 |
| SN74LVC1T45 |
| SN74LVC2T45 |
| SN74LVC4245A |
| SN74LVCC3245A |
| SN74LVCC4245A |



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| **Instrumentation Amplifiers** | |
| Programmable-Gain Instrumentation Amplifiers | sboa024 |
| AC Coupling Instrumentation and Difference Amplifiers | sboa003 |
| Boost Instrument Amp CMR with Common-Mode Driven Supplies | sboa014 |
| Increasing INA117 Differential Input Range | sboa001 |
| Input Filtering the INA117 ±200V Difference Amplifier | sboa016 |
| Level Shifting Signals with Differential Amplifiers | sboa038 |
| **Isolation Analog Amplifiers** | |
| Simple Output Filter Eliminates Amp Output Ripple, Keeps Full Bandwidth | sboa012 |
| Single-Supply Operation of Isolation Amplifiers | sboa004 |
| Isolation Amps Hike Accuracy and Reliability | sboa064 |
| **Operational Amplifiers** | |
| High-Voltage Signal Conditioning for Low Voltage ADCs | sboa097 |
| High-Voltage Signal Conditioning for Differential ADCs | sboa096 |
| Make a –10V to +10V Adjustable Precision Voltage Source | sboa052 |
| ±200V Difference Amplifier with Common-Mode Voltage Monitor | sboa005 |
| Boost Amplifier Output Swing with Simple Modification | sboa009 |
| Extending the Common-Mode Range of Difference Amplifiers | sboa008 |
| Simple Circuit Delivers 38Vp-p at 5A from 28V Unipolar Supply | sboa037 |
| Pressure Transducer to ADC Application | sloa056 |
| Amplifiers & Bits: Introduction to Selecting Amps for Data Converters (Rev. B) | sloa035b |
| Precision Absolute Value Circuits | sboa068 |
| Signal Conditioning Piezoelectric Sensors (Rev. A) | sloa033a |
| Boost Instrument Amp CMR with Common-Mode Driven Supplies | sboa014 |
| Comparison of Noise Perf. of FET Transimpedence Amp/Switched Integrator | sboa034 |
| DC Motor Speed Controller: Control a DC Motor w/o Tachometer Feedback | sboa043 |
| Diode-Based Temperature Measurement | sboa019 |
| Level Shifting Signals with Differential Amplifiers | sboa038 |
| Operational Amplifier Macromodels: A Comparison | sboa027 |
| Single-Supply, Low-Power Measurements of Bridge Networks | sboa018 |
| Thermistor Temperature Transducer to ADC Application | sloa052 |
| Signal Conditioning Wheatstone Resistive Bridge Sensors | sloa034 |
| 3V Accelerometer Featuring TLV2772 Application Brief | slva050 |
| Low-Power Signal Conditioning for a Pressure Sensor | slaa034 |
| **Sensors, Sensors Conditioning, 4-20mA Transmitters** | |
| Implementing a 4mA to 20mA Current Loop on TI DSPs | szza045 |
| 20mA to 0-20mA Converter & Current Summing Current-to-Current Converters | sboa053 |
| 0-20mA Receiver using RCV42 | sbva004 |
| Four-Wire RTD Current-Loop Transmitter | sbfa007 |
| IC Building Blocks Form Complete Isolated 4-20mA Current-Loop | sboa017 |
| Input Overload Protection for the RCV420 4-20mA Current-Loop Receiver | sbva003 |
| Single Supply 4-20mA Current Loop Receiver | sboa023 |
| Use Low-Impedance Bridges on 4-20mA Current Loop | sboa025 |
| Build a 3-Phase Sine Wave Generator with the UAF42 | sbfa013 |
| Design a 60Hz Notch Filter with the UAF42 | sbfa012 |
| Photodiode Monitoring with Op Amps | sboa035 |
| Interfacing the MSP430 and TMP100 I$^2$C Temperature Sensor | slaa151 |
| **Solenoid/Valve Power Drivers, TEC & Pump Laser Bias** | |
| PWM Power Driver Modulation Schemes | sloa092 |
| Thermo-Electric Cooler Control using a TMS320F2812 DSP and DRV592 Power Amplifier | spra873 |
| **Data Converters-Analog Monitor and Control Circuitry** | |
| AMC7820REF: A Reference Design for DWDM Pump Lasers | sbaa072 |
| **Analog-to-Digital Converters** | |
| Data Converters for Industrial Power Measurements | sbaa117 |
| Using Ceramic Resonators with the ADS1255/6 | sbaa104 |
| Standard Procedure Direct Meas. Sub-picosecond RMS Jitter High-Speed ADC | slwa036 |
| High-Voltage Signal Conditioning for Differential ADCs | sboa096 |

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| LVDS Outputs on the ADS527x | sbaa118 |
| Measuring Temperature with the ADS1216, ADS1217, or ADS1218 (Rev. A) | sbaa073a |
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| Combining ADS1202 w/ FPGA Digital Filter for Current Meas. in Motor Cntrl App | sbaa094 |
| ADS1240/41 App-Note: Accessing the Onboard Temp Diode in the ADS1240/41 | sbaa083 |
| Pressure Transducer to ADC Application | sloa056 |
| Complete Temp Data Acquisition System From a Single +5V Supply | sbaa050 |
| Voltage Ref. Scaling Techniques Increase Converter and Resolution Accuracy | sbaa008 |
| Thermistor Temperature Transducer to ADC Application | sloa052 |
| **Digital-to-Analog Converters** | |
| SPI-Based Data Acquisition/Monitor Using the TLC2551 Serial ADC (Rev. A) | slaa108a |
| MSC1210: Incorp. the MSC1210 into Electronic Weight Scale Systems (Rev. A) | sbaa092a |
| Measuring Temperature with the ADS1216, ADS1217, or ADS1218 (Rev. A) | sbaa073a |
| Using the MSC121x as a High-Precision Intelligent Temperature Sensor | sbaa100 |
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| Comparing Bus Solutions (Rev. A) | slla067a |
| Signaling Rate versus Transfer Rate | slla098 |
| Introduction to the Controller Area Network (CAN) | sloa101 |
| A System Evaluation of CAN Transceivers | slla109 |
| M-LVDS Signaling Rate Versus Distance | slla127 |
| RS-485 for E-Meter Applications (Rev. A) | slla112a |
| Use Receiver Equalization to Extend RS-485 Data Communications | slla169 |
| RS-485 at 230-kbps over Uncontrolled Interconnect | slla167 |
| The RS-485 Unit Load and Maximum Number of Bus Connections | slla166 |
| RS-485 for Digital Motor Control Applications | slla143 |
| **Control and Monitoring-Power and Logic** | |
| Linear Products Brush Motor Control | slit110 |
| TPIC6C596 Power+Logic™ Shift Register Application | slia082 |
| TPIC6595 Power+Logic™ 8-Bit Shift Reg. with Low-Side Power DMOS Switches (Rev. A) | slpa004a |
| **RF** | |
| Implementing a Bi-directional Frequency Hopping Application with TRF6903 and MSP430 | swra041 |
| Implementing a Bi-directional Wireless UART Application w/TRF6903 & MSP430 | swra039 |
| Designing with the TRF6900 Single-Chip RF Transceiver (Rev. D) | swra033d |
| Designing Switching Voltage Regulators with the TL494 (Rev. C) | slva001c |
| **Power Management-Voltage References and Shunts** | |
| Improved Voltage Reference Filter has Several Advantages | sbva010 |
| Low Power Operation of REF102 10.0V Precision Voltage Reference | sbva008 |
| Diode-Based Temperature Measurement | sboa019 |
| **Power Management Special Functions** | |
| Closed Loop Temperature Regulation Using the UC3638 H-Bridge Motor (Rev. A) | slua202a |
| DN-50 Simple Tech. for Isolating and Correcting Common App. Problems | slua182 |
| U-102 UC1637/2637/3637 Switched Mode Controller for DC Motor Drive | slua137 |
| U-112 A High Precision PWM Transconductance Amplifier for Microstepping | slua073 |
| U-115 New Integ. Circuit Produces Robust, Noise Immune Sys. for Brushless | slua106 |
| U-120 A Simple. Approach to DC Motor Modeling for Dynamic Stability Analysis | slua076 |
| U-130 Dedicated ICs Simplify Brushless DC Servo Amplifier Design | slua083 |
| UC3717 and L-C Filter Reduce EMI and Chopping Losses in Step Motor | slua141 |



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| 新加坡 | 800-886-1028 |
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